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The Archives of Ophthalmology is a bi-monthly journal, published in annual volumes of about six hundred pages each, extensively illustrated with cuts in the text, half-tone text plates, and lithographic plates, many in colors.

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VOL. L. NO. 1.

ARCHIVES OF OPHTHALMOLOGY.

THE TREPHINE IN CHRONIC GLAUCOMA.

BY T. HARRISON BUTLER, BIRMINGHAM, ENGLAND.

ONE of the greatest of American writers has expressed the opinion that "a foolish consistency is the hobgoblin of little minds." These words apply with especial force to medical subjects, including the treatment of glaucoma. I do not hesitate therefore to express views which differ materially from those I have published in past years, and which in the light of further experience have proved to be erroneous. In 1915 I contributed a paper to this journal ARCHIVES OF OPHTHALMOLOGY, vol. xliv., No. 6, page 611) in which I cast doubts upon the suitability of sclerotomy as the operation of election in glaucoma simplex. Smarting from the disappointment caused by several serious cases of late infection I too hastily decided to abandon sclerotomy, and in actual fact treated a series of cases of chronic and subacute glaucoma by various forms of iridectomy. The result was disappointing, for careful analysis of all my examples of chronic glaucoma treated by iridectomy showed that but 43% of them were permanently relieved by the procedure. Many of the eyes were subsequently trephined with varying success. I also found that trephining after iridectomy was neither so easy nor so successful as primary trephining. On the other hand all cases of sclerotomy analyzed to the same date yielded a success percentage of 64. It also appeared that Holth's punch operation was more effective in reducing tension than the operation with the 1.5*mm* trephine, but that nearly all the cases of late infection up to this date had followed punch operations. The chief source of failure in these sclerotomies was firm healing of the aperture with cessation of filtration or inadequate filtration. My results at this time formed the subject of a paper which I read to the Midland Ophthalmological Society in 1918 (*Transactions of the Ophthalmological Society of the United Kingdom*, vol. xxxviii., page 368). It had by this time become obvious to me that for some reason difficult to explain the punch operation was more liable to be followed by late infection than the trephine method, and must be abandoned. Also that the 1.5*mm* trephine was too small to yield a sufficient percentage of filtering scars. I therefore began to use a 2*mm* trephine of my own design. The result has been most gratifying. During the years 1918 and 1919 I have trephined over 80 eyes in some 70 patients. Forty-odd of these operations have been undertaken to relieve tension in glaucoma simplex (chronic glaucoma without congestive signs) and, as far as my notes take me, all have been more or less successful. That is to say that at the time the last note was made tension had been normalized or so far reduced that the disease had apparently been arrested. Some of these patients have been observed for over two years, others for not more than a few months. Time will naturally show that a proportion of these eyes are still glaucomatous, in fact the percentage of recovery may easily fall to 80 or 85%; but up to the time of writing, August, 1920, none of these 40 operations has been proved to be a failure. In four more cases the first trephining was unsatisfactory, but subsequent operations were successful. If I combine these operations, 48 in all, with my older trephine operations, 52 in number, we get 100 trephining operations for glaucoma simplex with 23 failures, or a success percentage of 77. Three of the 23 failures were cured by a second or third operation, which gives a final result of 80% successful up to date, and as far as the present history is known. These figures compel me to be inconsistent, and at the present time to hold the view that trephining with a 2*mm* instrument *performed early in the disease* holds out an excellent chance of the long intermission or complete cure of the disease. Let it, however, be understood that these figures apply solely to glaucoma simplex, cases in which the disease is characterized by rise of tension, cupping of the disk, and contraction of the fields, or enlargement of the blind spot, or both; and that cases with signs of congestion are excluded. The operation in acute glaucoma, subacute glaucoma, and in secondary glaucoma yields other percentages of cure, and the results are far more difficult to analyze because the circumstances vary more than in glaucoma simplex.

During the past two years I have been increasingly impressed with the necessity for early operation. The indications I act upon are raised tension combined with signs of impairment of function. If for example the tension by the Schiotz tonometer is 30, and there are no signs of functional failure or of marked cupping of the disks, I would not operate, but in the presence of such signs I should use a miotic for a few weeks, taking the tension twice a week, and recording it on a chart. If at the end of a month miotics had not reduced the tension I should operate. Were the original tension above 30 I should not wait so long, and above 40 I would not wait at all. Whereas there seems to be a tendency to revert to the use of miotics and to postpone or even omit operation, it would appear that the time is ripe for an exact research upon the action of these drugs in chronic glaucoma. Most of our opinions upon the subject have been handed down from pre-tonometric days and are therefore founded upon an insecure basis. I take it that a miotic lowers tension mechanically by withdrawing the iris from the iridic angle just as atropine mechanically raises tension by the reverse process. If, however, the iridic angle be of adequate patency, as in a normal eye, atropine does not raise the tension, nor does eserine lower it. In some examples of early chronic glaucoma, the anterior chamber is not unduly shallow, nor is the pupil dilated. How then can contracting a normal pupil in a normal chamber lower the tension? My clinical experience is that in such cases a miotic has no such action. On the other hand, in subacute and acute glaucoma with a dilated pupil, if a miotic be successful in contracting the pupil, tension may be lowered, and I have seen more than one case of acute glaucoma in which the free use of eserine and morphine has lowered the tension, reduced the congestion, and greatly facilitated iridectomy. Again there are late cases of chronic glaucoma with a narrow iridic angle and a dilated pupil in which the tension falls if the pupil can be got to contract.

Careful observations with the tonometer in cases with normal chamber and pupil should decide the question finally. I personally am doubtful as to the permanent efficiency of miotics in eyes without shallow chambers, and I wonder whether some at least of the cases which are said to do well on miotics would not do equally well without any local treatment. General attention to the health is I think more important. I prefer to reserve miotic treatment for cases in which, owing to age, to nervous instability, or to other circumstances, operation is contraindicated. I have not yet satisfied myself that miotics have any permanent value in glaucoma simplex, and *if their use tends to postpone operation much harm is done.* I am fully aware that these opinions are heterodox and I am prepared to change them at once when I obtain proof of the value of local drug treatment.

Some surgeons believe that when the contraction of the field menaces the fixation point any operation is apt to cause total loss of central vision and that iridectomy is especially dangerous. In my own practice this has happened but twice, once after iridectomy, once after sclerotomy. My own view is that *the more the fixation point is menaced either by contraction of the peripheral field or by the presence of a Bjerrum scotoma the more urgent is immediate operation.* I have trephined several such cases with and without iridectomy. All have been successful except one. When the field of vision is contracted to within a few degrees of the fixation point, blindness if the case is left alone is a matter of months or even weeks, whereas operation offers a splendid prospect that the rapid contraction will cease, and in one or two cases I have seen a large increase in the fields of vision. In a few exceptional cases contraction of the peripheral fields and the formation of scotomata has continued although the tension has been normalized by operation.

The operations recorded have been performed upon my private patients, at the Birmingham Eye Hospital, and in the Ophthalmic Clinic attached to the General Hospitals at Coventry and at Leamington Spa.

In nearly all the patients operated upon in 1918 and in 1919 the tension has been recorded by the Schiotz tonometer, and in many cases it has been charted upon my tonometric chart.

The peripheral fields have been carefully studied, and when necessary the central area has been explored with the Bjerrum screen, now I believe called the tangent screen. In hospital practice there is little time for work of this nature, but a rapid test has been made in all cases of doubt to exclude or confirm the presence of a central scotoma. In more than one patient the presence of a Bjerrum scotoma has been the sole change detected in the field.

The operations have been carried out according to the most recent Elliot technique. Cocaine in 4% solution is instilled three times; the first instillation being combined with one of a 1.0% solution of eserine to avoid dilatation of the pupil. The conjunctiva is seized with straight iris forceps and reflected to the limbus with squint scissors. The conjunctiva is now further reflected with a few strokes of a Landolt scalpel till the gray crescent appears in the cornea. I find that if the scalpel be applied to the exact spot where the conjunctiva leaves the cornea little progress is made, if, however, it be applied slightly forward onto the conjunctiva itself, say about half a millimeter away from the corneal aspect, the progress is easy. Great care is taken to make the flap as thick as possible. The *2mm* trephine is applied as close to the line of reflection as possible, and tilted to cut the sclera in trapdoor fashion. The disk is now seized together with any prolapsed iris and excised. If the iris does not prolapse I do not fish for it and omit the iridectomy. The flap is sewn in place by a single suture. The dressing is removed next day and atropine instilled. This is repeated daily if any undue injection be noted. Few of the operations occupied more than ten minutes, the majority about five or six minutes. The only real drawback that has appeared in the last series of cases is the occasional formation of a large ectatic bleb. These patients have so far done well and appear to be more permanently benefited than those with a more beautiful type of scar. In a few cases the anterior chamber has remained shallow for a fortnight. There seems to be a tendency for a nuclear cataract to develop, and some of the older operations which were originally classed as successful should for this reason be reclassified as partial failures. This is one of the complications which will tend to reduce the percentage of success in the series under review from 100 to 80 or thereabouts. Iritis was occasionally noticed but gave no trouble.

Late infection. In addition to the examples of this complication which I published in the *Ophthalmoscope*, vol. xiii., p. 370, I have a few more to recount—two of them in patients who have already had previous attacks, and two primary cases. These I hope to record in another paper. Their presence shows that late infection is indeed the tragedy of sclerotomy, but in view of the high percentage of success obtained from the operation and its marked superiority in other respects, we can only regard them as part of the toll glaucoma demands.

The results in absolute glaucoma even when there are no congestive signs are not very satisfactory; in the presence of congestion they are very poor. It is probably wiser to remove painful eyes when inflamed, for trephining offers but a slender chance of relief. In non-congestive but painful absolute glaucoma I leave the choice of operation to the patient.

OPERATIONS FOR GLAUCOMA SIMPLEX 1918 AND 1919

Name	*T. before operation*	*T. after operation*	*V. before operation*	*V. after operation*	*Nature of operation*	*Remarks*
1 Duckett	45	19	6/18	6/18	T c I	Seen 10 months after operation.
2 "	55	32	6/18	6/12	T c I	Fields before operation all within 5° circle. No change after operation.
3 Plummer	38	14	6/9	6/9	T c I	Deep cups and very small fields, concentric contraction.
4 "	60	17	H. R.	6/60	T c I	Fields smaller when last seen.
5 Perry	85	– 2	1/60	3/60	T c I	Deep cup and shallow anterior chamber.
6 Bowbotham	60	Tn	6/6	6/5	T c I	Ideal filtering scars.
7 "	80	Tn	6/6	6/5	T c I	
8 Jones	35	10	6/60	6/18	T c I	Nasal step in field. Good increase in acuity.
9 Stevens	45	23	6/9	6/9	T	Had a Herbert's wedge isolation done a year before this operation.
10 "	34	30	< 6/60	< 6/60	T	A fair result only. A very late case.
11 Wells	33	13	6/12	6/12	T	The other eye had an iridectomy 20 years ago for acute glaucoma. T. 15.
12 Blyth	50	10	6/18	6/12	T	Large ectatic scar. Nasal half of field gone. Seen 2 years later. Result still good.
13 Tiffany	48	32	< 6/60	< 6/60	T	Almost absolute glaucoma. A year later no pain, disk not cupped.
14 Law	35	Tn	6/6	6/6	T	Fields increased after operation.
15 "	35	Tn	6/60	6/36	T	Disks became less cupped.
16 Butler	47	17	6/24	6/24	T c I	
17 Ray	40	29	6/60	6/60	T	Minute central field only 1–2 degrees. There is an isolated seeing island on temporal side.
18 Bassett	80	34	6/18 –	6/18 –	T c I	Iridectomy in 1915 did not reduce T.
19 Brewer	60	– 1	Fingers	Fingers	T c I	Seen some months later. Fields and vision well maintained.

OPERATIONS FOR GLAUCOMA SIMPLEX 1918 AND 1919

Name	*T. before operation*	*T. after operation*	*V. before operation*	*V. after operation*	*Nature of operation*	*Remarks*
20 Spencer	60	8	6/18	6/18	T c I	3 months later good vision and satisfactory eyes in spite of hypotony.
21 "	44	8	6/12	6/12	T c I	Before operation rapid loss of fields.
22 Smith	100	12	< 6/60	6/36	T c I	Note the increase in acuity.
23 "	60	22	6/60	6/36	T c I	
24 Lewis	66	18	Fingers at 2*m*	6/12	T c I	Great increase in acuity. Scleral puncture before trephine.
25 "	60	29	"	6/60	T c I	
26 Jakeman	68	20	6/36	6/12	T	Late infection, 7 months after operation.
27 "	68	20	P. L.	No P. L.	T	
28 Clarke	62	25	6/12	6/18	T c I	Very small fields became almost normal.
29 "	62	25	6/18	6/36	T c I	Lens remained forward 14 days. Slight iritis and synechiæ.
30 Showell	55	17	Fingers	6/24	T	Note increase in acuity.
31 "	50	8	"	6/18	T c I	
32 Clews	60	14	P. L.	P. L.	T c I	
33 Crooks	?	26	6/12	6/12	T	Original notes mislaid.
34 "	?	18	6/6	6/6	T	Trephined for raised tension.
35 Dalton	60	5	6/35	6/18	T c scleral puncture	
36 Harrison	63	20	6/36	6/12	T c I	
37 Filby	70	27	6/8	6/12	T c I	Left eye had had an iridectomy. T. still 45.
38 Gluther	60	− 2	< 6/60	< 6/60	T	Cataract. Second operation, had late infection after first.
39 Belfield	70	25	6/60	6/60	T	Has had four trephines, last one produced an ectatic scar, and was successful.

OPERATIONS FOR GLAUCOMA SIMPLEX 1918 AND 1919

Name	*T. before operation*	*T. after operation*	*V. before operation*	*V. after operation*	*Nature of operation*	*Remarks*
40 Gray	45	10	6/60	6/60	T	4th trephine produced an ectatic scar and reduced T. Had a slight late infection a month after operation.
41 Beasley	70	19	P.L.	P.L.		First hole closed up, operation repeated.
42 "	61	22	"	"		
43 Rice	50	7·5	6/6	6/6		
OPERATIONS FOR ABSOLUTE GLAUCOMA						
Dalton	60	8	No P.L.		T	Trephined to relieve pain with success.
White	48		"		T	Eye became injected and was excised. A very late case.
Edinburgh	44		"		T	No relief of pain or tension.
Brewer	140	140	"		T	Pain relieved but eye still stone hard. Fibrous mass on site of operation blocked hole.
Salt	60		"		T	No result. Hole blocked with iris tissue.
Priest	72	?	"		T	Died at home, final result unknown.

HISTOLOGY OF THE REGION OF THE CORNEOSCLERAL MARGIN.

PART I. HISTOLOGY OF THE SUPERFICIAL LAYER OF THIS REGION.

BY DR. KAZUO HIWATARI, KAGOSHIMA, JAPAN.

(*With four illustrations on Text-Plate I.*)

THERE is many a hiatus in our knowledge of the histology of the corneoscleral margin, and some of the known conditions have admitted of various interpretations. For instance, no mention is made anywhere of the rare congenital condition, which I am the first to describe, of an island of mucous membrane in this region covered with cylindrical instead of flat epithelium, and, as will be shown later, Manz (2), Ciaccio (3), and H. Virchow (1) differ in their descriptions of the ridgelike formation of the subepithelial layer of the limbus. A consideration of these facts has led me to regard this region as a field for new, accurate histological work.

MATERIALS AND METHODS.

It is evidently very desirable that such an investigation as this should be prosecuted with material fixed while warm with life, but this is difficult to accomplish. I collected the material in the winter, usually from four to forty-eight hours after death, and fixed it either in a 10% solution of formol, or in Orth's mixture. In removing the eyeballs the globes were extirpated together with the lids, so that the bulbar conjunctiva should be spared as much as possible. After fixation was sufficient the region of the limbus was carefully dissected off. The sexes and ages of the individual cases were as follows:

Case	*Sex*	*Age*
1	m.	40 days
2	f.	60 days
3	m.	10 months
4	m.	13 years
5	m.	17 years
6	m.	20 years
7	m.	24 years
8	m.	28 years
9	f.	29 years
10	m.	45 years
11	m.	58 years
12	m.	68 years
13	m.	79 years
14	f.	80 years

The celloidin method was used for the preparation of the sections, which were cut sagittally, horizontally, and parallel to the surface (surface sections), part of them in series, varying for the most part from 8 to 14 μ in thickness. The stains used were hæmatoxylin (Boehmer)-eosin, Weigert's hæmatoxylin and van Gieson, Unna-Pappenheim's methyl green pironin, and the elastic stain (Weigert's method and orcein). For comparison I used many microscopic preparations in the collection belonging to this ophthalmological clinic. Furthermore I used Kiyono's lithioncarmine vital stain on some rabbits' eyes in order to ascertain as accurately as possible the kinds of cells in the subepithelial layer of the limbus.

HISTOLOGICAL FINDINGS.

It is necessary first to define the margins of the limbus, as these have been fixed differently by different authors. I agree with H. Virchow (*l. c.*) in considering the limbus to be the segment of conjunctiva which begins toward the cornea at the end of Bowman's membrane and extends toward the fornix to a place overlying Schlemm's canal. The breadth of the limbus corneæ so defined, the conjunctiva cornealis of H. Virchow, is about 2μ according to that writer. But as this breadth is clinically demonstrable to vary in different places, I measured it in four different directions and present the results in the following table:

Age	*Sex*	*Breadth of Limbus*			
		Above	*Below*	*Nasally*	*Temporally*
40 days	m.	1.20μ	0.80μ	0.80μ	0.80μ
60 days	f.	1.20	1.00	0.80	0.80
10 months	m.	1.40	1.20	1.00	1.00
13 years	m.	2.25	1.50	1.20	0.95
17 years	m.	2.00	1.80	1.00	1.00
20 years	m.	2.25	1.95	1.50	1.50
24 years	m.	2.00	1.50	1.00	1.00
28 years	m.	2.25	1.80	1.20	1.20
29 years	f.	2.00	1.95	1.20	1.20
45 years	m.	2.00	1.50	1.00	1.00
58 years	m.	1.80	1.50	1.00	1.00
68 years	m.	2.00	1.50	1.20	1.20
79 years	m.	2.00	1.80	1.50	1.50
80 years	f.	2.25	1.80	1.50	1.50

As one can see from this table the breadth is regularly greatest above, somewhat less below, and still less, but about equal, nasally and temporally.

A. THE EPITHELIAL LAYER.

The construction of the epithelial layer was described first by Manz (*l. c.*), but most accurately by H. Virchow (*l. c.*). According to the latter the epithelial layer is composed of six layers at a distance of about 60 cylindrical cells breadth from the end of Bowman's membrane, and presents rather the type of the corneal epithelium, while laterally it comes to resemble more and more the conjunctival, in that the cylindrical basal cells change into cuboidal and the superficial flat cells gradually become larger. From six to thirteen layers are to be found between the elevations of the tunica propria, which will be discussed later.

One needs to be very careful in counting the number of layers of epithelium in cadaveric material, as the epithelial layer is very easily broken down, and the epithelia thrown off, by the post-mortem maceration. The material must therefore be as fresh as possible. My eighth case, a man 28 years old who died from ileus, but was otherwise sound, was best suited for this purpose. Six hours after death the eyes were extirpated with the observance of every precaution and prepared. I counted the number of layers in this material and found, in agreement with Virchow, that they were from ten to thirteen over the depressions and from five to seven over the elevations. The deepest layer of epithelium was cylindrical, the middle polygonal, and the superficial flat.

The pigmentation of the limbus epithelium, which, according to Kopsch (13), was demonstrable in one third of all Europeans examined, was observed also by Virchow (*l. c.*). According to the latter it is most marked in the basal cells and gradually decreases toward the surface. The pigment appears in the form of red brown, roundish granules in the cell body, closely grouped on the distal side of the nucleus portion.

I have found this pigmentation to be quite constant, whence it may be concluded that this condition is regularly present in the colored races. The degree of pigmentation varies in different cases, and in different places in the same case. When it was very marked the pigment was abundant in almost all the epithelia, but much more so in the deeper than in the superficial layers. Such marked pigmentation was present in cases 7, 10, 11, 12, and 13. Slight pigmentation, in which only the epithelia in the deeper layers were affected while those in the superficial were for the most part free from pigment, was shown in cases 1, 2, and 3. The remaining cases, 4, 5, 6, 8, 9, and 14, were moderately pigmented, in that pigmented epithelia were present only in the basal and middle layers of cells. Although the number of children is not large enough to warrant any deductions, the conclusion that in general the pigmentation is less in children than in adults seems to me to be justified, because I found it to be less in them than in the least pigmented cases in adults. The pigmentation was so sparse in the children that it could be demonstrated only under a high magnifying power.

The varying degree of pigmentation in different places in the same case was striking. Questioning whether this might not be due to the effect of light, I determined the pigment content of the upper part of the limbus, which had been covered during life by the upper lid, and of the portion in the palpebral fissure, which had not been protected from the light, and compared the two in five cases. Contrary to my expectations the former proved in each case to be the richer in pigment. This proves incorrect the suggestion of Fischer (12), that the pigmentation of the limbus may possibly be to protect the eye from too much light.

I wish to mention here two original observations made by me in regard to the pigmentation: the occurrence of pigment in the epithelium of the cornea adjoining the limbus, and of chromatophores in the subepithelial layer. The former was met with in only five strongly pigmented cases, and the number of the pigmented epithelia was small. In the very strongly pigmented Case 12 I counted seven pigmented epithelia in one section (Fig. 1), while in the other cases I could find only two or three. In Fig. 1 we see that the pigmented epithelia extend to a place about ten basal cells breadth beyond the end of Bowman's membrane, and that they are both basal and superficial.

Chromatophores were found in all cases. The number varied, but in general was greater the more strongly the subjacent layer of epithelium was pigmented. Yet the number was not great, even in the most strongly pigmented Case 12, for they did not occur in every section. Neither of these two conditions has hitherto been described by anyone, although the eyes of the colored races have often been used for examination—Giacomini (11), Steiner (10), Fischer (*l. c.*).

H. Virchow (*l. c.*) says that mucous cells, which he denominates wandering mucous cells, are very rarely to be met with in the conjunctiva cornealis. I found them only in a single case, that of a boy 13 years old (Case 4). I found them in the upper part of the limbus, quite superficial and typically globular, surrounded by flat epithelium with no cylindrical epithelium to be found in their neighborhood. The total number in four series of sections 12μ thick was thirteen. When they occur at all in the limbus they are confined to a very small area, never close together, but always with a variable number of ordinary epithelia between two neighboring mucous cells. Whether this is always the case or not must be determined by future researches.

Wandering cells occur singly in this region, especially in the basal layer, where they are more abundant than in the cornea, but I have never seen such a dense infiltration with them as was described by H. Virchow.

An interesting condition, to which I have already called attention in a former work (9), is the occurrence of an island of mucous membrane which, presenting the character of the fornix, is covered with laminated cylindrical cells. I was able to find this in only three out of 120 preparations belonging to this clinic, that is, in about 2.50 per cent. In my former paper I expressed my opinion concerning the signification of this anomaly in the pathology of the conjunctiva.

B. TUNICA PROPRIA

The tunica propria of the region of the limbus consists of a loose connective tissue continuous with the subconjunctiva and episcleral layers, which blend together in denser fasciculi to pass over finally into the corneal tissue. Elastic fibers which approach the end of Bowman's membrane are mixed with this connective tissue. The tunica propria is quite vascular because of the marginal loops and network of vessels. At the margin of Bowman's membrane, where the connective tissue fibers are dense and scarcely to be distinguished from the corneal tissue the lumina of the loop forming capillaries may be seen close beneath the epithelium. No differences of opinion now exist concerning any of these conditions.

There is not the same unanimity of opinion with regard to the nature of the papillary elevations to be met with here. The first writer to mention the presence of these elevations at the limbus was Manz (*l. c.*), who described them as a narrow ridge in which the elevations were joined together like a network. This was confirmed later by Ciaccio (*l. c.*). Both of these writers found them above and below, but on neither the nasal nor the temporal sides. Arnold (4) and Henle (5) disagreed with Manz and thought these ridges to be artificial folds of mucous membrane, but this idea was soon negatived through the point made by Ciaccio (*l. c.*) that if such were the case the epithelium would have to take part in the formation of the elevations. Nakagawa (6), who included various kinds of mammals in his researches, demonstrated the presence of these elevations in different animals, but found them to be most marked in man. He believed them to be papillæ, as did also Salzmann (8) and Stoehr (7). H. Virchow (*l. c.*) studied the ridge formation of the propria in a surface preparation according to Semper's dry method, and declared the condition to be not one of a network, as Manz and Ciaccio thought, but one of very fine, closely adjoining, sharply defined little crests arranged in a radiating manner. They were present everywhere except in a small segment on the nasal and temporal sides, and their greatest breadth was 0.5µ.

My own observations compel me to take a position in opposition to Nakagawa, Salzmann, and Stoehr, and to deny that the elevations partake of the nature of papillæ. They look like true papillæ when seen in meridional sections, but one can easily convince himself by examining surface sections that they are not papillæ, that they are ridge formations. It is scarcely possible for a doubt to exist after an examination of Fig. 2. The error made by the above-named authors may perhaps be due to the fact that they studied meridional sections only. Nakagawa certainly did not study surface sections; Salzmann and Stoehr made no positive statements in this regard. In respect to the conflicting statements of Manz and Ciaccio on the one hand and H. Virchow on the other, concerning the arrangement of the little crests, I have to agree with the former as I always found the netlike arrangement in my surface sections (Fig. 2). It is hard to understand how such a difference of opinion could arise between two such men as Manz and H. Virchow. It may be that the trouble lay in the different methods employed in the examination. In the so-called dry method of Semper, used by H. Virchow, the surface of the mucous membrane is denuded of epithelium by maceration and is then studied with a loupe, and it is hardly necessary to point out how inferior in exactitude such a method is to the microscopical examination of surface sections, particularly when the latter are made in series. These ridgelike formations seem to be absent in infants, as I was totally unable to find them in a 40 days old child (Case 1), and found them only above in a 60 days old child (Case 2). The breadth of the zone at its broadest place was 1.35µ, according to my measurement. Most of the elevations, not all, as Nakagawa states, contain capillary vessels like true papillæ.

No positive statements have hitherto been made concerning the nature of the cells in the tunica propria of the limbus. Nakagawa (*l. c.*) simply mentions the presence of round cells there without discussing their nature. In my opinion these round cells are not all alike, but consist of scattered lymphocytes, plasma cells, and histiocytes of Kiyono (klasmacytes of Ranvier), the last of which may be shown most clearly in sections from the vital stained rabbit's eye (Fig. 3). The presence of chromatophores in the tunica propria I have mentioned already in the description of the pigmentation of the epithelium. For the most part they are spindle-shaped and lie mainly in the upper third of the subepithelial layer, though sometimes deeper, and chiefly in the neighborhood of the capillaries. The nucleus is pale, spindle-shaped, and usually provided with two or three nuclear corpuscles. The granules of pigment contained in them are quite like those in the epithelia (Fig. 4).

RÉSUMÉ.

1. The pigmentation of the epithelium of the limbus corneæ (conjunctiva cornealis) is constant among the Japanese, but varies in degree, while, according to Kopsch, it was present in only a third of the Europeans examined. Generally speaking the pigmentation is less in children than in adults. In each case the portion covered by the eyelid is more pigmented than that in the region of the palpebral fissure.
2. The pigmentation of the epithelium sometimes extends into the cornea adjacent to the limbus.
3. Chromatophores are a constant finding in the propria.
4. The last two findings are quite new and are described for the first time by me.
5. Two variations in the epithelium of the limbus were noted—an island of mucous membrane with cylindrical epithelium, and a circumscribed portion of mucous membrane with beaker cells. The former was found in 2.5 per cent. of 120 cases examined, the latter in a single case out of fourteen.
6. The tunica propria of the limbus presents elevations in

the form of ridges, not of papillæ, which are most distinct above and are wanting on the nasal and temporal sides.

7. The ridges have a netlike arrangement as described by Manz. The degree of their development varies in different cases; they were completely absent in an infant 40 days old.

8. Four kinds of cells may be distinguished in the tunica propria of the limbus—lymphocytes, plasma cells, histiocytes, and chromatophores.

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ASTIGMATISM—ESPECIALLY WITH REGARD TO THE INFLUENCE OF AGE UPON THE AXIS.

By Dr. A. W. STIRLING, Atlanta, Ga.

I BELIEVE that one is correct in saying that the common understanding among ophthalmologists in relation to the axis of the correcting convex lens in astigmatism still continues to be that it tends to be vertical, and of the concave lens that it tends to be horizontal. Indeed ophthalmologists are accustomed to speak of such astigmatism as being "According to the Rule," while the opposite tendency is one "Against the Rule." The position of the axis also is supposed to remain generally more or less permanent. But the figures set out in the following paper appear convincingly to demonstrate that this is such a partial truth as to be in reality no truth at all. They show rather that the axis tends to rotate with age, until in the later decades of life the "Rule," inclines to be entirely reversed. In the spring of this year I wrote an article upon this subject[1] from which I shall here take the liberty of quoting:—"For some years an impression has been growing upon the writer that there exists a definite relationship between age and the axis of astigmatism. This impression, which gradually grew into a conviction, was that the 'Rule' which says that the axis in hypermetropic astigmatism tends to be vertical, while correct for young people is the reverse of correct for the elderly, and that therefore in middle age the axis takes a middle course. How completely the conviction is supported by the facts will appear in this paper. It is possible that this question has already arisen and been examined and settled, but if so the fact has escaped the writer, while a friend who was recently resident for three years in the New York Eye and Ear Infirmary, in which certain of the surgeons pay much attention to refraction, states that the conclusions which follow are entirely new to him. About the year 1894 the writer on a number of occasions watched his friend, the late Dr. George Bull, in his consulting rooms in Paris at work on refraction cases in which he took much interest. He was greatly occupied with the various causes of blurred vision, among them of course astigmatism; and I remember that he laid particular stress upon the 'clignement,'[1] of the lids in producing at least temporary astigmatism, which would naturally be 'According to the Rule.' He afterwards published two or three papers on this subject[1] which I believe were well received by ophthalmologists. For instance, Parsons says[2]: 'Perhaps the pressure of the lids on the globe tends to squeeze it above and below.' . . . To test the question the writer considered that the fairest method would be to take old cases as they came in his card system, using no diseased eyes, and record them in tabular form. He began strictly according to that rule, but later modified it to this extent: he decided that one is more liable to error with the small degrees of astigmatism, and after having recorded a number of eyes with .25 D. and .37 D. he passed cases of these amounts and noted only .50 D. and over. Later as his time was limited he decided to pass all ages between 20 and 50 of which he had already included a considerable number, and rather to stress the contrast between the astigmatism of the eyes under 20 and that of those over 50 years old. Except for these particulars cases were recorded as they came in the cards."

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[1] *British Journal of Ophthalmology*, vol. iv., no. 11.

It has since appeared to the writer that the subject was worthy of more effort, and he decided to continue the investigation upon a larger scale. The present article is the result, and in it are incorporated the eyes used in the other, a summary of whose figures, however, for the sake of comparison, is also set down. It was decided to begin in the case records where the previous article had left off, to take as I had done before each as it came, and to put down whatever therein appeared relative to the investigation in all the cards contained in a certain number of drawers. I mean by this to make it clear that there was no choice of records, but that the figures which occur are the result of the mere chance of the alphabetical arrangement of the card system. The following restrictions were, however, observed. I have quoted those used in the other paper which referred to the first 200 eyes as they appeared on the records. The restrictions were similar for the eyes that followed, modified to this extent:—in hypermetropic cases it was not considered necessary farther to demonstrate that in young people the axis tends to be vertical, "According to the Rule," and therefore no eye was recorded under 50 years old. But as there had been an insufficient number, only 23, of myopic eyes examined in the former article it was desirable to bring out the contrast, if there were any, between the first two and the later decades of life, and therefore in the second series to record the myopic eyes of patients in the first two and in those decades after 50 years of age. It may be stated that in practically all eyes under 40 years old a cycloplegic (2 per cent. homatropine and cocaine) was used, and that none was used in the majority of the other eyes. No diseased eye was included; and when only one of a patient's eyes was astigmatic it was not used. The eyes of coloured people were excluded.

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[1] "Lid Pressure on the Cornea," *Trans. Intern. Ophth. Congress.* Edinburgh, 1894, p. 107; and "Visual Effects of Refractive Error," *Trans. Ophth. Soc. of U. K.*, 1896, vol. xvi., p. 200.

[2] *Diseases of the Eye*, p. 52.

As in the previous article the method pursued in the investigation "was to mark on a table of ruled paper the number of the case, the age in decades, the amount and kind of the astigmatism, and the axis. The exact degree of the axis was not recorded, but the test frame was divided into sections of 15 degrees each, while the vertical axis (90 degrees) and the horizontal axis (180 degrees) had each a separate column. It was simpler to use a test frame in which the figures beginning on each side at the nose increased downwards to 90 and then upwards on the temporal side to 180, like the old English frame, and similar to the American in the left eye but differing on the right. The following is an example, and shows the first three lines of a table, the x of course indicating to which section the axis belonged.

Should someone else wish to make similar investigations and

R. E. with cyclo.	No. of Case	Age in Decades	Degrees															
			90	90 to 75	90 to 105	75 to 60	105 to 120	60 to 45	120 to 135	45 to 30	135 to 150	30 to 15	150 to 165	15 to 0	165 to 180	180	Ast. in D +	Ast. in D −
	I.	2	x														.50	
	II.	7									x						1.0	
	III.	2														x		·75

care to follow this method I would suggest that a slightly greater degree of accuracy might be attained by avoiding the repetition of the same degrees. It may be observed that I have for instance 90 to 105, and also 105 to 120. When the axis is 105 it might be registered in either column. I stupidly failed to notice this until I had done some work upon this paper, presumably because I had always used the column to the left. In the present paper the right was therefore preferred, and if we compare the results we find that the effect of the oversight was negligible. To give the tables in full would occupy great space. A mere summary of the results will suffice.

The total number of eyes registered was 544, of which 416 were hypermetropic, and 128 myopic. Of the hypermetropic eyes 107 were under 50 years of age, 309 over 50; of the myopic 79 were under 50, 49 over 50. (The odd figures are accounted for by the fact that in a few cases one eye in the same person was hypermetropic, the other myopic.) Myopia is not common in the Southern States.

As has been already said, after a few of the lower denominations of astigmatism (19 of plus .25 D. and 4 of plus .37 D. but none which was myopic) had been included it was decided to use only those of .50 D. and upwards, because axial error is thus less likely.

The average degree of hypermetropia registered was .87 D. (In the previous article the figures were .83 D.); of myopia 1.02 D.; of the two combined .91 D.

The averages were worked out for each decade separately, and do not appear to have any definite variation with age, but run for hypermetropia in no distinct order from .50 D. to 1.35 D., and for myopia from 1.0 D. to 2.0 D.

The point of main interest in these observations lies in the apparent rotation of the axis with advancing years, and this seems to apply to myopia as well as to hypermetropia (a vertical plus lens of course corresponding to a horizontal minus lens), and as will immediately appear this seems to be a very usual occurrence. Thus, of 107 hypermetropic eyes under 50 years old 17 or 15.9 per cent. were more nearly horizontal than vertical; of 309 hypermetropic eyes over 50 years old 196 or 63.4 per cent. were more nearly horizontal. (In the previous article these figures were respectively 15 and 75.)

Of the 79 myopic eyes under 50 years old 54 or 68.3 per cent. were more nearly horizontal than vertical; and of the 49 myopic eyes over 50 years old 18 or 36.7 per cent. were more nearly horizontal than vertical.

Taking the decades separately from the first to the ninth in the hypermetropic eyes those nearer horizontal than vertical were in percentages: Decade I, only 2 eyes, O; II, 38 eyes, 10.5; III, 26 eyes, 11.6; IV, 26 eyes, 23.1; V, 15 eyes, 27.0; VI, 163 eyes, 55.9; VII, 111 eyes, 70.2; VIII, 33 eyes, 76.6; IX, 2 eyes, 100. In the previous paper the percentages for hypermetropic eyes, missing out decades I and IX in each of which there were only 2 eyes (vertical in the first, horizontal in the ninth), were respectively from the second to the eighth: 10.6; 15.4; 23.0; 27.0; 56.3; 60.0; 83.3; a series of figures showing a like gradation, and very similar steps.

In the myopic eyes the percentages of those more nearly horizontal than vertical were: Decade I, 4 eyes, 100; II, 62 eyes, 69.3; III, IV, V, combined, 13 eyes, 53.8; VI, 35 eyes, 40; VII, 13 eyes, 37.7; VIII, 1 eye, 0; IX, no cases.

In this as in the previous article the average distance of the axis from the horizontal in each decade was measured by using the middle figure of each of the above-mentioned segments of 15 degrees each, which is close enough for our purpose. These distances were in the hypertrophic eyes from the first to the ninth decades respectively in degrees 83.0; 75.4; 75.8; 65.6; 59.5; 38.5; 29.9; 23.7; and 4.0.

The myopic eyes gave the following distances of the axes from the horizontal: for the first two decades combined (there were only 4 eyes in the first decade) 25.7; for the third, fourth, and fifth decades combined 46.7; for the sixth 51.6; and for the seventh 55.3.

It seems fair to conclude from the above series of figures that we must modify the so-called "Rule" for astigmatism, which appears to be true enough for young eyes, but the reverse for the elderly; and also that there is quite commonly a rotary movement of the axis proceeding slowly with the passage of time.

In the previous paper it was stated that the rotation did not appear to occur much more commonly in one direction than the other, because in hypermetropic oblique astigmatism the axis was found in the eyes under investigation to run down and out in 57 per cent. and down and in in 43 per cent. In the hypermetropic eyes with oblique astigmatism of the present article (47.5 per cent. of all the hypermetropic eyes) the axis of the correcting convex lens ran down and out in 59.6 per cent. and down and in in 40.4 per cent. In the myopic eyes with oblique astigmatism (54.7 per cent. of all the myopic astigmatic eyes) the axis of the correcting concave lens ran down and out in 32.8 per cent., and down and in in 67.2 per cent.

There does, therefore, appear to be in both hypermetropic and myopic eyes distinctly greater tendency for the meridian of greater corneal curvature to wheel towards the nose than away from it; that is, presuming the astigmatism to be corneal, a question which might best be settled from the records of those who use an ophthalmometer.

Another method of investigating the question of this axial rotation would be through the histories of the same eyes during long periods. Of course comparatively few such cases are available. In going over my notes, however, I have come across a number of which the following is the most illustrative because the most fully recorded case. The patient's astigmatism between 1905, when he was 47 years old, and 1918, the year of the last examination, showed a tendency to vary from plus .50 D. to plus .37 D. or plus .25 D. The right axis in 1905 was 75 degrees from the horizontal; in 1906, 1907, and 1908 it was practically the same; in 1915 it was only 45 degrees, and in 1916 20 degrees from the horizontal. The left eye in 1905 was 65 degrees; in 1906, 1907, and 1908, 55 degrees; in 1915, 45 degrees; in 1916, 15 degrees from the horizontal; and in 1918 it was horizontal.

But I have also noticed a couple of hypermetropic cases in which after an interval of years the axis had swung away from the horizontal. It is quite possible that further observation may show that it occasionally happens that axes beginning at 180 degrees turn away from the horizontal. Why they should so begin, and why they should so change would be another puzzle for the interested student.

Advantage was taken of the prepared tables to enquire into the following additional questions which it was thought might possibly have some bearing on the movement of the axis:

What is the percentage of the cases examined in which the amount of the astigmatism differs in the two eyes? The answer is 25.5 in the hypermetropic, and 24.3 in the myopic cases; and there appears to be no special inclination towards this difference at any particular age, which perhaps tends to support the contention that the amount of astigmatism does not generally show a tendency to change with years. This question does not seem to have any bearing upon the change of axis. But there is a somewhat interesting gradation noticeable in the percentage of hypermetropic astigmatic persons whose axes differ in the two eyes. If axes are changing it is reasonable that they need not change precisely with the same rapidity in the two eyes. Forty-one per cent. of such cases occur in my tables, and the figures progress from 15 per cent., during the first two decades combined through 37 per cent. for the third, fourth, and fifth decades, to 40 per cent. for the sixth, and 50 per cent. for each of the remaining seventh, eighth, and ninth decades. In the comparatively few myopic cases 52.5 per cent. show a difference of axes in the two eyes, but without a regular gradation from one decade to another.

The question of ætiology inevitably arises. Why does the astigmatic cornea generally begin its life with one particular curvature? Is that due to the *clignement*, to the pressure of the lids? Would such hypothetical pressure continued throughout life in the same direction explain a varying axis? Or does the curvature antedate the pressure? Is it then due to some slight developmental irregularity in fetal life?

And how explain the rotation of the axis? Is it the resultant of two forces continuing throughout life, the lid pressure and another, the former being gradually overcome? Or is the effect of the lids a myth, and the rotation due to one force? And what might be that force? I think it must be the pressure of the lateral external muscles, exerted especially in such actions as those of reading. When one considers that in running through an ordinary novel of 350 pages the eyes make perhaps 12,000 double lateral movements, and that the serious work of many people entails such movements for many hours daily during the greater part of a lifetime, it does not seem absurd to suspect that the sedentary customs of modern life may tend in time to change the curvature of individual corneæ. It would be an interesting task to compare the corneæ in this respect of readers and the illiterate, and also of those Eastern scholars the lines of whose books run vertically.

We are taking for granted that the astigmatism is purely corneal; but in this we may perhaps be assuming too much. While no statistics of my own cases have been collected their effect has been a strong impression that on examining lenses through fully dilated pupils one finds that a large proportion of the lenses of the later decades of life show peripheral opacities. Does the universal gradual sclerosis of the lens nucleus along with this tendency to vacuolation have a relationship to the changing axis? It would doubtless be going too far to conclude that by gradually changing the refraction and introducing a tendency to myopia slight peripheral cataractous formation is actually an attempt of nature to remove the disadvantage of presbyopia in relation to near work; but when the opacities develop slowly, as is very often the case, and do not obstruct vision, that is sometimes precisely what happens. Hence the oft-repeated story of persons who having had normal distance vision in youth and middle age when 70 or 80 read comfortably without glasses. But if we suppose that lenticular opacities produce a change in the nature of astigmatism, it has to be explained why it should so commonly be in one and the same direction, a greater puzzle than is provided by the hypothesis that the astigmatism is corneal.

DISEASES OF THE EYE DUE TO SYPHILIS AND TRYPANOSOMIASIS AMONG THE NEGROES OF AFRICA.[1]

By Dr. J. N. ROY, Physician to the Hôtel-Dieu, Montreal; Late Special Delegate of the Canadian Government; Laureate of the Academy of Medicine of France.

AMONG the many subjects for study, which have most interested me, during my last journey to Africa, where I visited twenty-two different colonies, were syphilis and human trypanosomiasis. If the geographical distribution of sleeping sickness is relatively easy to determine, since this affection had its birth in this continent, the same cannot be said of syphilis, which was imported at various periods, and introduced in manifold ways.

Much has been written of the origin of pox. However, it is not my aim to sum up the different theories here; I will content myself with merely stating the principal ones in connection with the subject I am treating.

According to the opinion expressed by Sydenham, Haller, and later by Sprengel (1796), Africa was the primary center of syphilis, which next came to Europe. In my opinion, this hypothesis is incomplete for, if I am ready to accept it in part, I must reject it as a fundamental idea. Indeed, it is generally admitted that Asia was the cradle of this affection, and that it existed in the East Indies from a very early date. The Ethiopians, and above all the Egyptians, in daily contact with the people dwelling on the coast of the Red Sea and the Levant, were naturally all exposed to the contagion. Moreover, the first Arabian conquerors, syphilized for a long time back, established themselves definitely in Northern Africa during the seventh century, by repulsing the Berbers or by mingling with them. In 711, the Moors invaded the south of Spain, which they occupied for more than seven hundred years, and during this period, bands of natives were constantly crossing the Strait of Gibraltar.

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[1] Read before the Canadian Medical Association, Quebec, June, 1919.

In Europe, we can say that the history of pox dates chiefly from 1493, the date at which Christopher Columbus returned from his first voyage to America. I will not discuss the opinions expressed on the probability of the importation or exportation of this disease by the sailors of the intrepid Genoese navigator. I will content myself merely with recalling that in South America, the specific lesions have been observed in the skeletons of Indians who inhabited the country before the Spanish conquest. Moreover, as I have already intimated in another article, to me the redskins are Mongols who crossed Bering Strait, and peopled this vast continent. And besides, it is admitted that the Chinese have been syphilitic for an indefinite period.

As we have been able to note, the negroes have not yet been brought into the case, and it is necessary to consult the most recent works in order to find a more precise hypothesis. Mühry (1856) thinks that syphilis was imported from tropical Africa to Portugal in the fourteenth century, during the reign of King Henry the Navigator. I am unable to share this opinion because, in all the Dark Continent, it is exactly in the periequatorial region that syphilis is least common, and its hereditary manifestations are exceedingly rare. Moreover, in the great forest, this affection was unknown before the arrival of Europeans. Without going further into details, I think that the long sojourn of the Moors in Spain, driven from Andalusia in 1492 by Ferdinand and Isabella, has contributed largely toward syphilizing this part of Europe, even before the return of Columbus.

I believe then that syphilis was imported from Asia to Northern Africa, and that the Arabs and the Berbers infected the Moors of Mauretania, who, in their turn, have transmitted their pox to the negroes with whom they came in contact.

The Ethiopians were contaminated in two different ways:

first by the Egyptians always at war with them, and next by the Arabs who, coming from Yemen, crossed Erythræ and the Somali Coast, and took possession of Harar, the capital of the country of the Gallas. Their very long stay at this place has left certain customs peculiar to their civilization, notably concerning women, and which we still find there to-day. H. Blanc is of the opinion that the Abyssinians were infected by the Portuguese during the fifteenth century. Surely at that period, syphilis already existed in Portugal, and had also for a long time back shown itself in Abyssinia.

From the mingling of the Fellahs of Egypt with the blacks, were born the Peuhls, who inhabited the region of Upper Senegal-Niger, and the Foulahs, who are met with especially at Fonta Djalon, in French Guinea. These Foulahs, called Fellanies in the English colonies, conquered and contaminated the powerful tribe of the Haoussas, localized in the neighborhood of Sokato and Kano in Nigeria.

It is interesting to note that these last-named blacks were acquainted with and actually practiced couching of cataract. This practice comes to them from the Fellanies, who themselves took it from their ancestors, the Fellahs of Egypt, where this operation has always been much esteemed.

These Peuhls, these Foulahs-Fellanies, and these Haoussas, races which are very nomadic, and very much infected with syphilis, have been of the highest importance as propagating agents in every spot they have traversed.

During my travels in this part of Africa, I noticed that the blacks connected with the Arabs, the Moors, the Egyptians, and their blends, have inherited not only pox, but also trachoma. This conjunctivitis is extremely common among the natives who inhabit the northern part of the continent, contrary to the opinion of Swan Burnett and certain other authors who believe that the negro is immune to it. Ocular and palpebral complications are as frequent and numerous among them as among other races who suffer from it, and in the desert this affection is, from every point of view, most serious. However, I should add that in all that part of Africa situated south of the 5° north parallel, trachoma is very rare, and in the great jungle it is absolutely unknown.

Angola was infected by the Portuguese, who have owned this colony for over four hundred years, and Eastern Portuguese Africa has shared the same fate.

South Africa, the scene of numerous wars between the natives, the Dutch, the Boers, and the English, has seen its magnificent blacks rapidly become more and more contaminated, especially by the soldiers. However, I must say that the last Anglo-Boer campaign was the most fatal. This is easily explained, because it is recognized that in Europe three times as much venereal disease is found in the British army as in the others, and particularly syphilis. Moreover, it has been observed that after each war, a great recrudescence of this kind of disease is always shown. The Zulus, who are one of the handsomest and healthiest races of all Africa, knowing nothing of syphilis before the arrival of Europeans, have named it "the white man's disease." Civilization has not only brought the Kaffirs this gift, it has also bequeathed them tuberculosis, and nowadays they are often attacked by acute phthisis, contracted in the mines of Johannesburg or elsewhere.

As it is admitted that the yellow race suffers a great deal from pox, it would have been interesting to seek for syphilis among the Hottentots and the Bushmen, who have in their veins Mongol blood, as we have had occasion to say in a previous work. Unfortunately, it is almost impossible to reach and study on the spot a sufficient number of the natives of these two tribes, now almost extinct, and thus arrive at a conclusion. Moreover, the means of communicating with them are most difficult, since they inhabit the frontiers of Portuguese Angola, of Southwest German Africa, and the neighboring English possessions.

English East Africa was infected particularly by Hindoos imported from Asia, who are also met with in Zanzibar and in Natal.

Africa has been almost entirely divided between certain countries of Europe, who are endeavoring to obtain the greatest possible profits from it. In order to penetrate into the interior, they have constructed railways, and put boats on the waterways, and in this manner the contaminated negroes have not been long, on their journeys, in transmitting their diseases.

Another means of contagion has been the transport of syphilitic black soldiers from one colony to another in the same country. And if, to all which I have just said, I add the scattered cases of pox imported by Europeans, not yet named, we see that this affection has entered Africa by many different places.

. . . .

Sleeping sickness, on the western coast of the Dark Continent, is spread on a belt of approximately 30°. In fact, we begin to meet it in the St. Louis region—and it spreads to upper Senegal, even to Timbuctoo, on the Niger. From St. Louis, we find it again more or less frequently on all the south coast as far as Mossamedes in Portuguese Angola. The French Congo and the Belgian Congo, with their gigantic rivers, are particularly contaminated.

In the Oubangui-Chari-Tchad region, trypanosomiasis is spreading to Bahr-el-Ghazal, and the neighborhood of Lake Victoria-Nyanza has been infected by the Belgian Congo.

Since some years back, it has made it appearance in the northeast of Northern Rhodesia, as well as in the neighborhood of Lakes Nyassa and Tanganyika.

Uganda is the part of Africa where sleeping sickness has caused the greatest ravages.

. . . .

I have had occasion to examine and study in a special way one hundred and thirty-five negroes, of whom the diagnostic of syphilis had been made without question; and it is the result of my observations on the ocular alterations of this disease which I desire to describe to-day. Most of these blacks, seen here and there, were brought to me in the hospitals, and traveled sometimes a great distance in order to meet me.

Thirty-eight cases among them had a perforation of the nasal septum, or of the palatine vault, or of both at the same time, and twenty other cases presented other lesions of osteitis. These syphilitics had therefore been very severely infected. As for the others, there was nothing particularly interesting about them, except that I have noted among certain subjects a rather strongly pronounced alteration of the buccal mucous membrane.

As the negroes, in general, treat their syphilis rather carelessly, or delay a very long time before having it attended to, I have been struck with the resistance which their eyes—and above all the deep membrane—presented to the spirochaeta of Schaudinn.

I can say the same thing as regards the spirochæta of Castellani, for in yaws, pustules can be found on the eyelids, but no diseases of the eye has yet been noted.

In the hundred and thirty-five cases of syphilis examined, I found ocular alterations only sixteen times, and with the exception of a single case, all the lesions were located in the anterior segment. There follows a very short recital of my observations:

Case Report 1.—Amadou Diop, Oualofs tribe, man of 22 years, syphilitic since 10 months. Iritis of the right eye, $V = \frac{1}{10}$. Left eye normal, Em. $V. = \frac{9}{5}$.

Case Report 2.—Sidiki Sidibe, Bambara tribe, man of 28 years, syphilitic since 1 year. Iritis of the right eye, $V = \frac{1}{8}$. Left eye normal, Em. $V = \frac{10}{5}$.

Case Report 3.—Amala Niamia, Galla tribe, woman of 20 years, syphilitic since 11 months. Iritis of the left eye, $V = \frac{1}{10}$. Right eye normal, Em. $V. = \frac{9}{5}$.

Case Report 4.—Makila, Haoussa tribe, man of 25 years, syphilitic since 2 years. Iridochoroiditis of right eye, finger at 3 metres. Left eye normal, Em. $V = \frac{8}{5}$.

Case Report 5.—Lufungula, Batanga tribe, man of 31 years, syphilitic since 5 years. Double chronic iridochoroiditis. Double consecutive cataract. Luminous perception.

Case Report 6.—Fondia Kamara, Soussous tribe, woman of 29 years, syphilitic since 2 years. Consecutive cataract. Pupillary seclusion. Sub-acute glaucoma. No luminous perception. Right eye normal, Em. $V = \frac{9}{5}$.

Case Report 7.—Fatima Ba, Peuhl tribe, woman of 45 years, syphilitic since 14 years. Chronic double iridochoroiditis. Double consecutive cataract. Luminous perception.

Case Report 8.—Boumba, Fantis tribe, woman of 40 years, syphilitic since 11 years. Chronic double iridochoroiditis. Right eye, fingers at 2 metres. Left eye, fingers at 1.50 metre.

Case Report 9.—Yaw Mensa, Ashanti tribe-man of 50 years, syphilitic since 30 years. Chronic double iridochoroiditis. Double consecutive cataract. No luminous perception. Perforation of the palatine vault and of the nasal septum.

Case Report 10.—Akula, Haoussa tribe, man of 25 years, syphilitic since 1 year. Double iridochoroiditis. Right eye, fingers at 3 metres. Left eye, fingers at 2 metres.

Case Report 11.—Agou Mabio, Bassa tribe, man of 38 years, syphilitic since 10 years. Chronic irido choroiditis of the right eye. Consecutive cataract. Luminous perception. Left eye normal, Em. $V = \frac{12}{5}$. Perforation of the nasal septum.

Case Report 12.—Bakary Koulibaly, Bambara tribe, man of 22 years, syphilitic since 2 years. Double disseminated choroiditis. Right eye, Em. $V = \frac{1}{8}$. Left eye, Em. $V = \frac{1}{10}$.

Case Report 13.—Simono, Crooman tribe, boy of 17 years, hereditary syphilis. Chronic parenchymatous keratitis of the right eye. Left eye normal. Right eye, Em. $V = \frac{1}{6}$. Left eye, Em. $V = \frac{18}{5}$.

Case Report 14.—Kum Nibape Kum, Duala tribe, man of 28 years, syphilitic since 11 months. Parenchymatous keratitis of the left eye. Right eye normal. Right eye, Em. $V = \frac{10}{5}$. Left eye, Fingers at 2 metres.

Case Report 15.—Isubi, Kumba tribe, man of 22 years, hereditary syphilis. Parenchymatous keratitis of left eye. Right eye normal. Right eye, Em. $V = \frac{9}{5}$. Left eye, Fingers at 3 metres.

Case Report 16.—Koko Ayaba, Macua tribe, woman of 19 years, hereditary syphilis. Double chronic parenchymatous keratitis. Right eye, Em. $V = \frac{1}{6}$. Left eye, Em. $V = \frac{1}{10}$.

In order to explain the very good vision of the healthy eye met with in some of the preceding cases, I shall repeat what I have already set forth at length in an article, namely that visual acuteness is better among negroes than among all other races.

In short, among one hundred and thirty-five syphilitics, I have seen three cases of iritis in the acute stage; eight cases of chronic or acute iridochoroiditis; four cases of parenchymatous keratitis; and a single case of disease of the fundus of the eye where the choroid was affected. I have never observed condyloma or gummata of the eyelids or of the iris, although it should all the same be met with from time to time.

The retina has always been found healthy, and the negroes, in a general way, are very little exposed to albuminuria, diabetes, leukæmia, or other diseases which ordinarily produce an alteration of this membrane. This is perhaps due to the fact that they live continually in the open air, that they have no moral cares, and that their food consists almost entirely of fruits, cereals, and vegetables. When they eat meat, they are accustomed to boil it so much that it no longer contains toxins, and the little alcohol they make and drink is harmless.

Paralysis of the ocular muscles has likewise never been noted, nor has optic neuritis.

I desire now to bring to your attention locomotor ataxia and the gray atrophy following. After a most thorough investigation I believe I am in a position to state that there is, as yet, no tabes among the African negroes. The disease is almost exclusively the endowment of the white race, as I have never met it among the Malays or the three thousand Redskins which I have examined in the two Americas. It is moreover excessively rare among the Asiatic Mongols, as well as among the Hindoos whose ancestors were Aryans. The negro, having no intellectual preoccupations, is not exposed to nervous affections, central or spinal, and with him, the most serious manifestations of syphilis are the lesions of osteitis. Moreover, as he perspires a great deal, and as he is constantly exposed to the sun, with very little clothing, his irritated skin is quite often affected.

The mulatto, on the contrary, is as predisposed as the white man to diseases of the brain and of the spinal cord, and it is, indeed, astonishing that a single intermixture can produce among the blacks, such important affects from the point of view of diathesis. We have likewise noted the same thing among the other half-breed.

If the proportion of iridochoroiditis appears, at first sight, to be rather high, this is because my arrival in the different centers becoming quickly known to the natives, they willingly brought the blind of their locality and its environs for my advice, and I, for this reason, examined the most serious cases.

From the observations which I made in Africa, I can say, with Dr. Santos Fernandez of Cuba, that the eyes of the blacks are very rarely affected in pox. This is contrary to the opinion of Dr. Pollot, who declares that negroes are strongly predisposed to syphilitic ocular diseases. It is probable that our American confrère intended to speak of the mulatto, not differentiating between him and the negro, when in reality, from a pathological point of view, an enormous difference exists. As already mentioned, a great number of my cases were very seriously infected, and the larger number had never received treatment. Moreover, I consider my statistics not absolutely exact, since the blind especially were brought to me, and then the diagnostic of syphilis was made. If, on the contrary, I had examined all those having pox in any district, I am sure that the percentage of ocular affections would have been less than that given in this article. The fact that I have met with a single case only of diseases of the fundus of the eye, is also an argument in favor of this hypothesis.

After having, here and there in Africa, studied syphilis and its manifestations of every description, I am disposed to believe that certain tribes are now immunized. The affections observed among the blacks of these tribes, are in general trifling and the bony lesions are extremely rare. However, woe to the other races infected by them—and especially the white—for, at that moment, the disease breaks out with a great virulence. Moreover, we know the pox has a particular degree of gravity when it is transmitted to a race primitively free from it. For example, in French Guinea, I have come in contact with a large number of Soussous recently contaminated by the Foulahs, of the Fouta Djalon; in Nigeria, some Yoroubas and Egbas, infected by the Haoussas; and finally on the Coast of Somalis, some Issas, Somalis, and Danakils, syphilized not long ago by the Ethiopians, showing large perforations of the roof of the mouth, or of the nasal septum. In other cases, syphilis was localized in the bones, and especially in the tibia. While traveling in Asia, and in South America, I have been equally impressed by this phenomenon of immunity among the Chinese and particularly among the Redskins.

According to Livingstone (1857), the pox would not persist under any form among the native pure blood races of Central Africa, but on the contrary, will manifest itself among half-breed populations. The authors who mention this opinion, think that if this fact was verified by a long observation, it would have to be admitted, the immunity depended on the race much more than on the climate. In my opinion, this great explorer, Scottish Missionary, was impressed by the large number of syphilitic mulattos found in the great cities of South Africa. Once in the interior of the country, seeing no longer this affection, he would have come to the conclusion that the blacks, living in the center of the Dark Continent, were more or less refractory to it, and that among them syphilis would always heal without leaving any traces. Useless for me to insist on the fact that such is not the usual course of the pox. Furthermore, this disease was not widespread among the natives of the great forest before the coming of the European, and even now, could very seldom be found. As far as immunity is concerned, I willingly admit its existence, but only among the races syphilized for many generations, and the climate would have nothing to do with it. And moreover, I believe this immunity can be found among all races.

. . . .

Medical literature already describes a certain number of cases of affections of the eyes in human trypanosomiasis. Thiroux and d'Anfreville de la Salle, having had under observation four blacks with oculary troubles, expressed themselves as follows: "In the first case, the matter was a diminution of visual acuity with hemeralopia and very violent pains of the eyeballs, in a patient who had never taken any atoxyl, and who had a quite severe œdema of the papilla. The treatment, which we feared to apply in this case, caused the accidents to disappear in a few days."

"In the other two cases, we have observed iridocyclitis; in one case, the inflammation of the iris rapidly disappeared under the influence of the medication; in the second, the disease was more tenacious, and lasted about three weeks, causing some small posterior synechia, though atropine had been used.

With this patient, iritis had been preceded by phlyctenary conjunctivitis, and by small lesions of ulcerous keratitis which had cured rapidly enough under the influence of calomel dressings.

"The fourth patient was suffering from widely spread chronic keratitis, the intensity diminishing at the dressing period, and becoming more acute at the relapse. The variations were specially rendered more sensitive by the more or less opaque appearance of the cornea. In man, this keratitis, though having a less rapid course, resembles very much the one so often found in trypanosomized animals."

Doctor Heckenroth, in a conversation told me of having treated a sharpshooter of forty years of age, of the tribe of the Malinkes, for a parenchymatous keratitis of the right eye, dating back to four months. This black—who was not a syphilitic—recognized to be afflicted with sleeping sickness, was injected with 0.75 centigrammes of atoxyl. This injection improved his sight considerably. At a later period, the patient during eight days, took 0.75 centigrammes of orpiment in pills every twenty-four hours, and two weeks after the beginning of the treatment, he was perfectly cured of his keratitis. Before going to the capital of the French Congo, I have met this sharpshooter—Bakary Kamara—who was in Doctor Thiroux' ward, at St. Louis of Senegal. Though he had been sick for two years and a half, his general condition was still satisfactory enough, his cornea were perfectly transparent and his emmetropic eyes had a vision of $\frac{9}{5}$ each.

To my knowledge, seven observations of affections of the eyes, in human trypanosomiasis, have been published in Europe. Unfortunately, some of these observations are incomplete, since in certain cases these oculary troubles are described in a very indefinite way, and in others, no examination of the fundus had been made.

Dr. Morax, in a series of very interesting and well documented articles, has exposed the pathology of the eye in sleeping sickness and trypanosomiasis of other varieties.

In Africa, having examined, in different hospitals and concentration camps, four hundred and eighteen blacks, affected by this terrible disease, I will relate briefly what I have found out regarding their eyes. In the first place, I will say that the alterations of the eyes of the natives of this continent are most uncommon in trypanosomiasis. Out of this number of cases, which are numerous enough, I have hardly found three cases showing trouble of the fundus, and even then, the etiology was doubtful, as I am now about to show.

Case Report 1.—Ikolo, Mongo tribe, woman of 22 years. This patient has suffered from trypanosomiasis for a year and a half. Within two weeks, she developed a diminution of sight. At present, she is given hypodermic injections of atoxyl. She is not syphilitic. This woman complains of violent headaches, and shows signs of meningitis. The general condition is bad. At the examination of the eyes, I found a double œdematous papillitis. The veins of the retina are dilated, but there is no hemorrhage. No dischromatopsy. The sensitiveness of the conjunctiva is preserved. The other parts of the eye are normal. Due to the apathetic state in which I found the patient, it is impossible for me to make a refraction.

Case Report 2.—Lokongo, Batetela tribe, man of 24 years. For two years suffering from sleeping sickness. Was always treated with hypodermic injections of satoxyl. His vision diminished within ten days. Has never contracted syphilis. Intense cephalalgy, and menigitis. General condition very bad. Ophthalmoscopic examination reveals a double œdematous papillitis. Dilatation of the veins of the retina, without hemorrhage. Colors are easily seen. Conjunctiva has retained its sensitiveness. Good pupillary reaction. The other parts of the eye are normal. As in the above preceding case, I cannot obtain any information about his refraction.

Case Report 3.—Sakana, Ababua tribe, woman of 23 years. This patient is infected for a year. Was treated first of all with atoxyl. Satoxyl is now given to her in hypodermic injections. A month ago, when admitted to the hospital, on the 6th of February, 1913, this woman was complaining of a diminution of visual acuity, of headaches, and was, it seems, showing signs of meningitis. No examination was then made of the fundus of the eye. She is not syphilitic. Her general condition, under the influence of this treatment, has greatly improved. The examination of the eye has shown a slight double œdematous papillitis, with a small dilatation of the veins of the retina, without hemorrhage. Colors are well recognized. Conjunctiva has retained its sensibility. The pupil reacts well. The other oculary membranes are in normal condition. Her refraction gives: Right eye, Em. V = $\frac{4}{5}$. Left eye, Em. V = $\frac{4}{5}$.

In my first two observations, the patients, in extremis, were really showing signs of meningitis, and pupillary œdema could have been just as well brought on by an increase of cephalorachidian liquid than by a direct infection of the trypanosoma.

In my last case, having made but one examination, it has been impossible for me to follow the evolution of the trypanosomiasis, and the consequences of his papillitis. Nevertheless, under the influence of a satoxyl treatment, the general symptoms and the visual acuity were rapidly improved,—without lumbar puncture—so this time, I believe to be in presence of a case of papillitous œdema, brought by trypanosoma. I would point out that the first observation of Thiroux and d'Anfreville de la Salle, is similar to mine, as far as the papilla is concerned. Also, until the microscope has settled the question of the presence or absence of this specific agency in the anatomical lesions, we will have to content ourselves with hypothesis.

The excellent visual acuity of the blacks affected by trypanosomiasis, has always impressed me, and in Belgian Congo, I even observed, in a boy of 18 years old, of the Basoko tribe, a vision of $\frac{20}{5}$.

According to me, the asthenopia of the eye, observed on certain subjects, in the last period, would be caused by the apathetic state in which they are before death—and which is characteristic—than to a special oculary manifestation in the sleeping sickness.

The sign of Argyll-Robertson has never yet been seen.

In my four hundred and eighteen patients, I have found nineteen white atrophies of the optic nerve, all following a treatment of atoxyl, or other arsenical salts. However, this does not present a great interest, since this toxic atrophy is very well known.

I never had the occasion to meet cases of palpebral œdema, iritis, cyclitis, iridocyclitis, parenchymatous keratitis, choroiditis, and chorioretinitis, such as mentioned by the authors who have made a study of the sleeping sickness. This is probably due to the fact that nearly all the subjects examined were under the influence of a treatment which had, more or less, sterilized them, and as a consequence, all ocular complications had relatively cleared up.

If we compare the published observations, we see that the percentage of affections of the eye, in human trypanosomiasis, is far greater among the Europeans than among the blacks. The period of incubation is also shorter with the first named, than with the last.

Since the same objective symptoms are observed with those afflicted with oculary lesions, in sleeping sickness and in syphilis, and since a certain parallel can be established between these two affections, I believe that the eye of the black offers a greater resistance to the trypanoma than to the spirochæta.

The trypanosomiasis found in Brasil does not seem to give ocular manifestations; nevertheless, from time to time, palpebral œdema is found.

To sum up, I will say that Africa has not been the cradle of syphilis. This affection coming from Asia, has first ravaged the populations of the northeast and the north of this continent, and then has been transmitted to the blacks. Later on, at different epochs, the pox has shown up on the coast, brought over especially by the Europeans.

In sleeping sickness, alterations of the eyes are seldom met with in the blacks of Africa.

With them, this organ resists very well to this infection—and much more than with trypanosomized animals, who often show oculary lesions.

In syphilis, the affections of the eye are most frequently found in the anterior segment, and is less frequent with the blacks than with the whites—as also observed in human trypanosomiasis.

The nervous system of the blacks appears to have never presented any specific manifestations.

Some African tribes seem to have a certain state of immunity against the pox, which is very slight with them, and this immunity has already struck me in Asia, and in South America.

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SYMPATHETIC OPHTHALMIA. REPORT OF A CASE SUCCESSFULLY TREATED.[1]

By Dr. ALFRED WIENER and Dr. ELLIS BONIME, New York.

SURGICAL—DR. ALFRED WIENER.

WE are all familiar with the outcome of most cases of sympathetic ophthalmia. In spite of treatment, and attempts at operative procedures, the recurrent inflammatory attacks which take place defeat all our efforts. The patient ultimately becomes blind. It is especially the plastic types which offer such grave prognoses. Any treatment which will enable us to save the vision, or even restore it to a serviceable form, is surely worthy of record. It was just such a case that came under my observation about twelve years ago. Every effort had been made to prevent these recurrent attacks, but it proved futile.

When I saw the patient for the first time in 1907, he gave me the following history: Briefly related, ten years previous to the above date, he had injured his left eye with a scissors. About six years later the right eye suffered, after being hit with a baseball. From the date of the first injury, there were judging from the patient's description, recurrent attacks of iridocyclitis in the left eye at various periods. After the sixth year, the right eye suffered similar attacks, undoubtedly precipitated by the injury from a baseball. The advice given by Dr. Herman Knapp at the time of the first injury to have the left eye enucleated was disregarded. Just previous to the time that he first consulted me, he had been put through a course of treatment consisting of inunctions, potassium iodide, sweats and local depletion, by Drs. Barkan and Sewall of San Francisco.

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[1] Presented at Section on Ophthalmology, New York Academy of Medicine, October, 1920.

The suspicion expressed at that time was that the patient was suffering from sympathetic ophthalmia.

My first examination of this patient made in September, 1907, showed the following condition: The vision in the right eye was $\frac{20}{200}$, and in the left eye $\frac{20}{70}$. In the right eye the pupil was bound down, and an iris bombe existed. The pupillary space was closed by a thin membrane, and the vitreous was so hazy that no details of the fundus were visible. The tension was slightly raised. In the left eye the pupil was drawn up and in, and an anterior synechia existed. This was probably the result of the former injury. This pupil was also closed by a thin membrane, and the whole anterior segment of the eye presented all the ear marks of a former plastic iridocyclitis. Again on account of the hazy vitreous, nothing definite in the fundus could be made out. Both eyes had distinct deposits on the posterior surface of the cornea, with well-marked corneo-scleral injection. The patient was of the robust type. A complete physical examination made at the time, revealed nothing of any significance. He denied ever having had any venereal infection. The first question which arose at that time in regard to the treatment, was whether the left eye, which had received the penetrating injury, and was in all probability the exciting eye, should be removed. As the disease now existed in both eyes, and the vision was better in the left eye than in the right, and furthermore, as it was not possible to say whether the vision in the right eye could be improved, we decided to place the patient under vigorous treatment and watch the result.

I performed an iridectomy on the right eye. Placed it under atropine and dionin instillations. The patient was given hot packs with pilocarpine injections, heavy doses of iodide of potash and salicylate of soda, with daily free catharsis. On January 2, 1908, the vision in the right eye had improved to $\frac{20}{30}$ and in the left eye to $\frac{20}{50}$.

The fundus in the right eye could now be seen. The disk was distinctly blurred, and the evidence was sufficient to show that a low grade of optic neuritis existed. An examination of the fields showed no contraction to white or colors. There were a few depigmented spots just above and to the outer side of the macula. The fundus in the left eye was so indistinct that no details could be made out. Between January and June of the same year, without any visible or ascertainable reason, the process lit up several times in the left eye, and the vision was again reduced to $\frac{20}{70}$. During the period between 1908 and 1914, in spite of all treatment and cautious living, there were recurrent attacks alternating between the right and left eyes, and the vision was very badly affected. In May, 1914, a rather severe attack occurred simultaneously in both eyes. The vision was very much reduced, but after treatment recovered itself in the right eye to $\frac{20}{40}$, but in the left eye remained at $\frac{10}{200}$. Attempts to establish pupils, in either eye at various times during the quiet intervals, resulted in failures. As rapidly as an opening was made, an attack would quickly follow and close up the gap with an exudation which obscured the vision. It was noticeable about this time, that these plastic exudations were insidiously closing up the anterior segments of both eyes. Likewise a band keratitis was making itself evident. During this critical period every effort was made to discover a possible etiological factor. Microscopical and chemical examinations of the blood were negative. A Wasserman and gonorrheal fixation test were made and also proved negative. Every effort was employed to discover a latent tuberculosis but none was found. Careful physical examinations with X-ray of the chest, nasal sinuses, and teeth, were made, but all proved negative. In spite of the fact that I personally felt that the left eye should be enucleated, no consensus of opinion could be arrived at. Its enucleation was refused as no definite promises could be made. A course of vigorous treatment was again decided upon. The treatment consisted in Hg injections, potassium iodide, hot packs with pilocarpine injection, sweats, vigorous catharsis, and massive doses of salicylate of soda, hot compresses with dionin and atropine instillations. The tonsils were removed, and the teeth carefully treated for suspicious foci. This treatment was kept up more vigorously when the attacks existed, and less so during the intervals. Again each time that I made a surgical endeavor to free the pupil in either eye, an immediate reaction took place, eventually defeating my purpose. February 10, 1919, the vision in the right eye was counting fingers at two feet, and in the left eye fingers at one foot. Tension was slightly minus in both eyes, measuring with the Schiotz 8*mm* of Hg, in the left eye, and 10*mm* of Hg in the right. The projection was good in both eyes. The band keratitis was more developed, and was occupying the central portion of the cornea in both eyes. In this desperate state, I was persuaded by the patient to make one more endeavor to obtain vision in the right eye. He was prepared most carefully, and given massive doses of salicylate of soda. In spite of this, an attempt to free the pupil was followed by so tremendous a reaction, that it was decided to give up all further attempts. The tension now was distinctly minus in both eyes, with fair projection in the right, and very poor in the left. In the right eye the anterior chamber was fairly normal in depth. The iris was discolored and atrophic. Its natural folds were obliterated. It appeared to be firmly bound down on the lens, and the pupillary area was closed by a rather thick membrane. A similar condition existed in the left eye but more exaggerated in type. The vision taken in the early part of September, 1919, was light perception in both eyes, and hand movements excentrically toward the right in the right eye. The patient was helpless, and had to be led about.

About this time I became acquainted with a method of treatment for chronic joint diseases, for which vaccines were given intravenously and subcutaneously. A colleague of mine practicing orthopedic surgery had been very successful with this class of cases, by allowing his patients to undergo a course of such vaccination. The theories upon which this vaccination were based were explained to me by Dr. Bonime. His method of therapo-immunity appealed to me at once, and I was anxious to make a trial of it in my patient. Of course a chronic joint is something very different from a chronic inflammation existing in an eye. Personally I have always been inclined to believe in the theory, which admits that sympathetic ophthalmia owes its existence to an infection pure and simple. Here was a method which dealt directly with this theory, and might give the results hoped for. I felt, that if in plain words, the patient could be sterilized, we might either prevent these plastic exudations from recurring, or if they had occurred, be able to operate without a consequent reaction destroying our result. In this case there was nothing to be lost and everything to be gained.

The patient was taken in charge of by Dr. Bonime. According to the method pursued by himself, a course of vaccination was given intravenously and subcutaneously. During this course of treatment I watched the patient very carefully for any exaggeration of his local symptoms. In the beginning of the treatment they were slightly more intense than they had been, but never so severe that it was necessary to interrupt the treatment. The patient experienced really very little local discomfort. The general reaction which was quite severe will be explained by Dr. Bonime. After six weeks the patient was ready for operative interference. As the tension in the left eye was decidedly minus, and the projection very poor, and there appeared to be no chance to better the vision in this eye, I decided to confine my efforts to the right eye. The tension in the right eye was practically normal, and the projection perfect. The vision was confined to hand movements. In order first to test out the eye, I made an attempt to perform an iridectomy. I was able to get away only a small piece of an atrophic iris. I waited one week and not the slightest reaction occurred. I then proceeded very cautiously to free the pupil from the underlying lens. Then the lens was removed by discission. It took several procedures to accomplish this. Not one of these attempts was attended by the slightest reaction, at once a proof that the infection must be under control. After the removal of the lens, I was confronted by a whitish looking exudate which existed in the vitreous just behind the lens. At first I tried to cut through it. This was found impossible without exerting too much pull upon the ciliary body. I finally, after several procedures with very sharp and fine needle knives, succeeded in separating it from its upper attachment. Gradually I procured an opening sufficient for the patient to obtain the first glimpse of vision he had had since one year. This has gradually improved since the last operation which was performed in April of this year. His vision taken on July 30, 1920, was $\frac{6}{100}$ with a +10 sph. = +0.75 cyl. ax. 15° N. The tension was normal and the projection perfect. The patient was going to his place of business and transacting ordinary business. He recently informed me that he played a game of golf. On taking his vision October 16, 1920, I find that with a plus 12 sph. in combination with a cylinder plus 1.50 axis 15° nasal he sees $\frac{15}{100}$. I don't think it is necessary to dilate upon the feelings of this patient, who just ten months previous had been pronounced not only by myself, but other colleagues, as a hopeless case.

Remarks. In view of the fact that a result was obtained in a case of sympathetic ophthalmia such as we rarely meet with, it is only fair to discuss the question, whether this is a true case of sympathetic ophthalmia, or what might be considered a relapsing chronic plastic iridocyclitis. I am in accord with Roemer, who considers the diagnosis of sympathetic ophthalmia only an apparent diagnosis. We know that sympathetic iridocyclitis is not characterized by any clinical specific peculiarities. This same clinical picture might be produced by the greatest variety of inflammatory excitants. We have no biological reaction which is characteristic of such a condition. Thus we are greatly handicapped at times in trying to prove that such a condition actually exists. It seems to me, however, if through careful clinical and serological examinations, all reasons for any other form of iridocyclitis have been excluded, this is surely one point in favor of the sympathetic type. If to this is added the history of a perforating injury to the globe, followed by a chronic plastic uveitis, especially of the insidious type leading to an ultimate loss of vision, I believe we have the right to assume, that such a case should be classed under the division of sympathetic ophthalmia. Another convincing argument seems to me to be the fact that, previous to the immunization, every attempt, when the eyes were quiescent, to create a pupil, in which of course it was necessary to deal with the iris, resulted almost at once in a reaction in both eyes. After the immunization, no more attacks occurred. That there should have been such a long interval between the involvement of the first and second eyes, can, I believe, be accounted for, by the fact, that this patient was under constant observation and treatment, most of the time, by men who recognized the gravity of the first injury and feared the consequences. The second injury, one might well expect, would precipitate just such an attack, where we have a right to assume that the predisposition existed.

As I did not wish to tire the reader, with a recital of all the clinical manifestations as they occurred during the various attacks, nor the finer details of the operative procedures, considering them unimportant, I have refrained from being more explicit. This report is simply made to acquaint my colleagues with the fact, that I believe we may have at hand a method, which will assist us in preserving the vision of not only serious cases of sympathetic ophthalmia, but also those intractable cases of recurrent iridocyclitis, in which a somewhat similar pathological destruction of the anterior segment of the eye takes place. Probably if treated early, when the first evidence of a recurrent inflammation is apparent, all such conditions might be arrested, no interference of vision take place, and all operative procedures avoided.

IMMUNO-THERAPY—DR. ELLIS BONIME.

A careful study of the literature, substantiated my original conviction, that this is the first time that the combination of specific and non-specific immuno-therapy has been applied in the treatment of sympathetic ophthalmia. That being the case, it will be in order to give the details of the inception of the treatment, even though running the risk of appearing trivial.

Dr. Leo Mayer, the orthopædic surgeon Dr. Wiener referred to in his paper, had just been observing the result obtained with combination of non-specific and specific immuno treatment of subacute and chronic joint conditions, when the case under discussion this evening came to his notice. His sympathy was aroused sufficiently to make him call on me, to see if in some way the patient could be benefited by vaccine treatment. I was extremely skeptical, but knowing very little about sympathetic ophthalmia, I suggested consultation with Dr. Wiener. At this consultation, I questioned Dr. Wiener very carefully, with the view of ascertaining whether it was remotely possible to place sympathetic ophthalmia in the category of infectious disease, or whether at least part of the pathology might be due to a low-grade infection. Dr. Wiener's opinion was that sympathetic ophthalmia might have an infectious basis, but that up to the present time, nothing to substantiate this theory had ever been discovered by either the pathologist or the bacteriologist. However, as the history of the case was one of severe reaction, inflammatory in character, following every attempt at surgical interference upon the eye, there was sufficient evidence in favor of a bacteriological etiology, to justify, in a desperate case like this one, what may seem drastic treatment.

A thorough test with tuberculin excluded tuberculosis. Then I proceeded to treat the patient in the same manner as I would a low-grade chronic joint infection, popularly known as rheumatism. I used typhoid bacillus vaccine intravenously, in preference to any other foreign protein, because of its easily measurable quantities, to obtain the non-specific protein reaction, and an autogenous streptococcus, obtained from the tonsilar region for the specific immune-response. In this particular case, however, on account of the susceptibility of the eye to the pneumococcus, I added an autogenous pneumococcus vaccine, obtained in the same manner and at the same time with the streptococcus.

Beginning with twenty-five million typhoid bacilli intravenously, I produced a very severe chill, followed by a rise in temperature to 104. Three days later, I repeated the same dose of typhoid bacillus, but increased the subcutaneous streptococcus injection to one hundred and fifty million. The chill was not pronounced, and the rise in temperature was only to 102.8. Four days later I increased the intravenous injection of typhoid bacilli to forty million, and the subcutaneous injection of streptococcus to 175 million. This time the chill was not very marked, and the temperature rose only to 102, despite the greater dose.

After a three-day interval, I again increased the dose, giving bacillus typhoid, 75 million intravenously, and pneumococcus, 200 million subcutaneously. This administration was followed by chilly sensations, lasting about an hour, but no distinct chill, and a rise of temperature of 103. The same dose repeated five days later, produced only a slight chill, and a temperature rise to 101.4. After an interval of another five days, the same dose repeated again, produced no chill and a temperature of 100.2. Three days later, the same dose produced no reaction. I then continued the subcutaneous injections of streptococcus and pneumococcus, administering 200 million streptococcus, and 250 million pneumo, increasing the dose to 225 million streptococcus, and 275 million pneumococcus a month later. Then again, about two weeks before the operation, 275 millions each of streptococcus and pneumococcus were given, and three days before the operation 300 million each were given.

Every intravenous injection was followed by a careful examination of the urine, especially for blood. On no occasion did we find occult blood present, and only once, a few red blood cells microscopically were found, and these we did not consider sufficient to interfere with the treatment. The presence of a macroscopic amount of blood would have been an indication for a longer interval between treatments, and a much more gradual scheme of dosage.

The mystery surrounding the defensive mechanism of the human body against invading pathological bacteria, is still so profound, that any explanation we can give regarding the observation made during the treatment, and the results obtained, can at most be speculative. But basing my conclusion on the most recent observations made by authorities on immunology, I formed the following theories:

Chronic infection may be the result of equilibrium established between the action of the bacteria on the one hand, and the immune response on the part of the individual on the other; or it may be the acquisition on the part of the organism of immunity against the action of the antibodies. Sometimes, such a status quo may be due to a deficiency of complement in the blood serum.

Most of you have probably observed that during the process of an acute infection, a present chronic infection, even of very long standing, will often disappear with the acute infection. An injection of foreign protein intravenously, produces a severe reaction, consisting of a chill, rise of temperature, profuse sweating, etc., simulating an acute infection; and like an acute infection, it rouses all of nature's latent mechanism of defense.

During this reaction, a superabundance of complement is formed, which completes the immune response against the organism causing the chronic infection, or aid in the therapeutic effect of the vaccines used.

In the case of sympathetic ophthalmia, it may also be possible that the repeated production of the protein reaction with the typhoid bacillus to a point of tolerance, may render the individual temporarily, at least, "reaction-proof."

Under the first theory, we have cured the chronic infection in the eye, making the surgical procedure possible; under the second theory, we render the patient "reaction-proof" for a time, at least, making surgical intervention possible without reaction. But whether you accept either one of these theories, or whether you reject both—I trust you will pardon my theorizing at all, in view of the practical, and I believe, far-reaching results obtained.

CYCLOPIA, ITS BEARING UPON CERTAIN PROBLEMS OF TERATOGENESIS AND OF NORMAL EMBRYOLOGY; WITH A DESCRIPTION OF A CYCLOCEPHALIC MONSTER.

By Dr. EMORY HILL, Richmond, Va.

(*Concluded.*)

(*With four illustrations in the text.*)

Histologic Examination.—The entire specimen had been preserved in formalin. The orbital contents were dehydrated in alcohol, embedded in celloidin, and sectioned serially from top to bottom, the sections varying from 15 to 20 microns in thickness. Tissues were treated similarly from the proboscis, the fungus-like growth on the head and back, the lids, the internal ear, and the abdominal organs which showed peculiarities. The lid tissue was embedded in paraffin. The following stains were used: hæmatoxylin and eosin, phosphotungstic acid hæmatoxylin, van Gieson, Pal-Weigert, toluidin blue, Golgi, and Mallory's neuroglia stain.

In the lids and conjunctiva, no abnormalities were seen except the absence of puncta and canaliculi and caruncles. The conjunctiva was devoid of adenoid tissue, as one would expect in the fetus and new-born infant.

The corneas showed a decided difference in development, the right being thicker than the left and having its layers better differentiated. The central portion of each cornea was very thin, measuring 132 microns in the center of the right cornea and 91.3 microns in the center of the left. The thinning took place abruptly at the lateral sclero-corneal junction in the case of the left cornea, but was more gradual in the right so that only about one half of the diameter of the cornea was excessively thin. The median portion of the two corneas passed gradually into the intervening sclera which was likewise very thin. An occasional blood vessel was seen in the periphery of the corneas. The epithelial layer was absent over most of the surface. In a few sections it was four cells deep; more often one or two cell layers were seen. Exposure and possibly trauma may explain the scant epithelium. Only at the far periphery was there an approach to the adult thickness of this layer. The left cornea was more denuded of epithelium than the right. Bowman's membrane was well developed only at the lateral periphery of the corneas. Its maximum thickness was 11.4 microns. It gradually thinned and disappeared shortly median to the iris angle. The left cornea showed a poorer development of this layer than the right. The substantia propria was imperfectly differentiated from the sclera, having a less regular disposition of its lamellæ than normal. Its greater richness in nuclei, as compared to the adult cornea, is to be expected in the fetal eye. The staining of the substantia propria by van Gieson's method indicated well its poor differentiation. It stained almost as deeply as the sclera, whereas normal cornea stains much less deeply. The deeper staining characteristic of ordinary connective tissue was more evident in the left cornea. Descemet's membrane was exceedingly thin where visible, and in most sections was not seen. The endothelium showed as a single layer of cells in the right cornea in most sections, but was not usually distinguishable in the left cornea from a non-cellular granular deposit upon the posterior corneal surface.

The sclera varied much in different areas. The portion intervening between the two corneas was highly vascular and thin, measuring less than ¼ millimeter. The lateral portions adjacent to the corneas bulged into a connective tissue mass 3.5 millimeters in width. This area corresponded to the rounded and rather sharp border of the protruding, flattened anterior segment of the globe already described. Schlemm's canal was seen in the lateral portions but was absent in the median sclera between the corneas and in the upper and lower quadrants. The posterior segment of the sclera was of normal width.

The anterior chambers were shallow and free of abnormal contents with the exception of a granular coagulum adjacent to the cornea. The iris angles were of the normal late-fetal type.

The irides were poorly developed in their lateral halves, and very rudimentary in their median halves. No muscle tissue was made out. No pupillary membrane was seen.

The ciliary bodies exhibited similarly a better development in the lateral portions and were smaller in their median portions. The meridional fibers of the ciliary muscles were more conspicuous than the circular fibers. The crowded aspect of the structures where the two eyes were fused in the midline was in strong contrast to the freer development of the lateral portions of the eyes.

The chorioid was normal in the anterior portion. In the posterior portion it consisted of a broad layer which was composed chiefly of a very loose reticular structure becoming more dense as it fused with the sclera, and a vascular portion next to the pigment epithelium having engorged vessels which presented a fairly clear division into choriocapillaris and a large vessel layer. There was no pigment in the chorioid, the chromatophores not containing pigment granules in fetal life. The pigment epithelium was generally adherent to the chorioid though the retina was detached.

The lenses were very small but otherwise normal except for the position of the left lens which was entirely below the horizontal plane in the inferior half of the globe, and the absence of zonular fibers. The maximum diameters of the right lens were 5 x 3*mm*, of the left lens 4.5 x 2.5*mm*.

The vitreous chamber was much diminished in size. Its fetal characteristics were not observed; the vascular system was nowhere seen. The partial separation into two chambers was everywhere indicated by the two retinas and, in the lowermost portion of the globe, by an irregular tongue of connective tissue which ran antero-posteriorly in the midline. The rough division into two eyes indicated larger diameters and better development of the structures of the right than of the left segment. The less orderly development of the lower portion of each segment accords with the usual observation that cyclopean eyes fuse mainly in the region of the fetal cleft. No coloboma or colobomatous cyst was found, however, in this specimen.

The retinas were detached in most of their extent. In general they followed the contour of the vitreous chamber from the lateral ciliary bodies backwards to the region of the posterior pole of the eye and from there curved forward running parallel to each other towards the median ciliary bodies. In the upper half of the globe the retinas approached the normal appearance. The scant and small ganglion cells and the absence of a nerve fiber layer were the principal abnormalities. A more perfect arrangement of the retinal layers was noted in the anterior than in the posterior portion. Adjacent to the papilla there was much folding, giving an appearance somewhat suggestive of rosette formation. In this region the nuclear and granular layers were all excessively broad and in places poorly defined, presenting an edematous appearance. The same condition was observed here and there throughout the extent of the retina, more especially in the lower part of the globe. Occasionally cross-sections of retinal vessels were seen, which in a few instances were accompanied by a slight perivascular round-cell accumulation. No fovea was made out. The rods and cones were well preserved in places, but frequently they were indistinct. The more distorted portions of the retina showed a predominance of neuroglia. This was strikingly evident in sections stained by Mallory's stain. One hesitates, however, to state that there was an actual excess of neuroglia; it may be that the scantier nervous elements allowed the relative excess of supporting tissue to assume larger proportions without an absolute increase of this tissue. The special stain for neuroglia disclosed the fact that the similarity of the retinal folds to rosettes was only superficial. The ganglion cells were nowhere of normal size and staining properties. Nissl granules could not be brought out by the toluidin blue method. The position of this layer was occupied by small cells whose nuclei were similar to those of the inner nuclear layer, but stained less deeply with nuclear stains. Only rarely could a cell body approximating the size and shape of a ganglion cell be distinguished. No nerve fibers were made out with certainty. The position which they should occupy was either not filled or was assumed by neuroglia fibrils.

The optic nerve apparently was altogether lacking. The nervelike structure seen macroscopically was composed of connective tissue and bore the central retinal vessels. This tissue was carried forward in the form of a tongue of mesoderm already mentioned as traversing the back part of the floor of the globe, indicating the partial division into two eyes.

The orbital tissues consisted of normal striated muscle and a large amount of fat. On each side of the globe, embedded in fat, were cross-sections of glands which correspond in structure to the lacrimal glands. This tissue was very scant; macroscopically no lacrimal glands were found.

The ciliary nerves were nowhere found; the blood vessels were abundant in the orbital tissues and the eyes, except for the scant retinal system; but these vessels could not be traced back to brain vessels. A few vessels were surrounded by a small round-cell accumulation.

The proboscis was composed of normal skin with hair follicles, sweat glands, fat, blood vessels, and a loose reticular subcutaneous tissue. The basal portion contained cartilage. The lumen was lined by stratified squamous epithelium. A few blood vessels were surrounded by round-cell accumulations. No olfactory nerves were found.

The mass of tissue occupying the head region was composed of thin-walled blood channels with a neuroglia framework and occasional cells which approximated the size and shape of nerve cells but showed no Nissl granules with the toluidin blue stain.

The decalcified petrous bone contained a normal cochlea with red blood cells in its cavity. No semicircular canals or nerves were found.

Interpretation of the Monstrosity.

The specimen described corresponds in general with the human cyclopean monsters reported in the literature. In the clumsy nomenclature of teratology it is an example of cyclo-exencephalo-rachischisis. The double character of the median eye with greater deformity in its lowermost part is the usual condition when the eyes reach a moderate degree of development. The damage to the brain and spinal cord is out of proportion to the damage to the optic vesicles. Cleland's (17, 18), observation is of interest in this connection. He found that dropsy occurred later and caused more injury in cyclopia than in anencephaly. It is probable that the central nervous system in this specimen developed at first proportionally to the eyes but was later destroyed by a great accumulation of cerebro-spinal fluid with subsequent rupture. The fungus-like growth occupying the position of the brain shows that some differentiation into nervous tissue has occurred. That the vascular system has been developed in the head region is evident from the abundant blood supply to most of the orbital tissues, although no connection exists any longer between the great vessels of the neck and the ocular circulation. The possibility that an inflammatory process is responsible for the failure of development in this specimen is suggested by the round-cell infiltration about blood vessels in the retina, muscle cone, and proboscis; this is a very occasional appearance and of very slight degree.

The better development of the cranial bones on the right side and of the right segment of the eye is not in accord with the better development of the left carotid artery. Probably too much stress is laid upon a correlation of blood supply with the growth of embryonic tissues. An attempt to correlate the abnormalities in this specimen with Assheton's (4, 5) dictum that the superior growing point of the embryo gives rise to the brain, medulla, heart, and foregut, while all the rest of the body is derived from the inferior growing point, is not altogether successful. The central nervous system, including the eyes, was involved and the heart was very abnormal in shape; but the failure in development of the diaphragm, with the consequent displacement of the stomach and spleen, and the apparent absence of the suprarenal bodies, cannot be associated with the embryonic foregut. The chief abnormalities accord with Assheton's theory and also with Adami's (1) conception that cyclopia is a "superior polar hypogenesis," as will be explained later; but it is evident that the faulty development in this specimen is not confined to those parts dominated by the growth center of the head end of the embryo. In addition, the diaphragm has failed to complete its descent and the pleuroperitoneal membrane seems to have lagged behind, making with the rest of the diaphragm a compartment containing two organs which should have been in the abdominal cavity;

and the suprarenal bodies are not seen, as is very frequently the case in cyclopia. No explanation can be offered for the latter fact. Whether a defect in the cervical sympathetic ganglia is associated with the failure of the suprarenals could not be determined in this specimen because of the age and condition of the tissues.

The degree of development of the eye structures indicates that the fetus was at least seven months old. The most important abnormality is the practical absence of ganglion cells and nerve fibers from the retina and the mesodermal character of the optic nervelike structure behind the globe. The disputed question of the origin of these tissues will be discussed among the problems of embryology suggested by the study of cyclopean specimens. It is believed that the failure of these tissues is part of the widespread destruction of the central nervous system in human cyclopia and that it does not justify the theory that these tissues depend upon the optic centers in the brain for their growth. It is noteworthy that the retinal circulation is scant and the retinal layers deriving nutrition from this circulation partly failed, whereas the other ocular blood supply is abundant.

The median face structures are entirely absent except for the scant cartilage and the equivalent of a single nasal cavity in the proboscis. The olfactory nerves are absent, as are all the other cranial nerves. The mouth does not show a triangular shape as Dareste thought it must inevitably do in cyclopia. The high degree of normal development of the body in general, aside from the head, back, and upper portion of the face, bears out the impression that there was an early evolution of the central nervous system which was subsequently destroyed by hydrocephalus.

VIII. MODERN EXPERIMENTAL TERATOGENESIS.

The third stage in the modern history of teratology, according to Piersol (91), is by far the most important period, in that it marks the removal of many problems from the realm of speculation to the realm of fact. Probably no question concerning monstrosities illustrates this better than the question of the origin and meaning of cyclopia.

The early experimental methods of dealing with chick embryos have been described. Further investigations by Driesch (22) and Loeb (61), using the sea-urchin eggs, of Schultze (96) with frog eggs and of Wilson with amphyoxus eggs proved that double monsters can be produced by mechanical and chemical means. Mall (63), Becker (12), and Stockard (115) have described at length the various experiments of Von Pflüger, Roux, Born, Hertwig, Spemann, Morgan, Schaper, and others who have dealt with general problems of teratogenesis. Certain experiments especially interest the student of cyclopia. The addition of chemicals to the sea water in which fish embryos are grown gives rise to a variety of monsters. Herbst (35) found that lithium salts caused the blastoderm of the sea-urchin eggs to invert; Morgan (75) made the same observation upon frog eggs. Loeb (62) using a 1.5% aqueous solution of potassium chloride in the sea water in which he grew fundulus eggs, noted that the heart, though developed, did not beat, and the blood vessels had an irregular lumen like a chain of beads. He considered this condition due to a lack of normal blood pressure. Similar conditions are found in human embryos, according to Mall. Morgan and Tsuda (73) found that 0.6% sodium chloride prevented the closure of the blastopore, and a great number of monsters resulted. Hertwig (37, 38), using the same method, found delayed gastrulation and spina bifida in frogs. Similar delay in the closure of the anterior end of the neural tube produced anencephaly. This observation is of particular interest because it is precisely opposite to the theoretical explanation of Dareste, which has been discussed earlier in this paper, namely that a premature closure of the anterior cleft of the neural tube is responsible for cyclopia and the grave brain defects which accompany this deformity. Hertwig (38) found that 0.7% sodium chloride produced spina bifida in every case of axolotl (1896). This experience no doubt led Hertwig to the conclusion that every ovum has the power to become a monster, a dictum pronounced so emphatically by Mall in various contributions in recent years. Spemann constricted eggs of triton during the two-cell or later stages by a fine thread tied about the circumference of the first cleavage plane. Double-headed monsters with cyclopia resulted. Lewis (59), using fundulus eggs, pricked the anterior end of the embryonic shield squeezing out some material by pressure after the needle was withdrawn. Little or no regeneration of nervous tissue occurred, and cyclopia resulted. Lewis believed that the eyes fused as a result of the absence of tissue which should lie between them.

Stockard's Experiments.

The remarkable contributions of C. R. Stockard between 1907 and 1913 taken together constitute an array of facts and logical deduction from facts which place cyclopia on a definite basis. Pursuing the plan of Hertwig, Morgan, and Loeb, Stockard (108, 109) utilized various metallic salts in varying proportions in sea water in which he grew the eggs of the teleost fish, Fundulus heteroclitus. Magnesium salts were the only ones which regularly produced a specific type of monster, cyclopia. Spemann (102) had already produced cyclopia in an amphibian (triton). Stockard (109) produced the first typical cyclopean fish (1907) and gave the first example of the consistent production of a vertebrate monster by changing the chemical environment of the embryo. By using an excess of magnesium chloride in sea water he produced cyclopia in 50% of his embryos (115). A $\frac{19}{60}$ molecular solution of magnesium chloride was the optimum proportion. Weaker and stronger solutions produced fewer cyclopean fish, showing that neither a chemical effect nor osmotic pressure is the cause of the monstrous development. Stockard (110) thinks the effect is toxic, the magnesium having an inhibitory or anesthetic effect which prevents the outpushing of the optic tissues. The cyclopean condition was evident in from sixty to seventy hours. The eggs were then placed in normal sea water, and continued to grow and hatch normally. All grades of cyclopia appeared, the eye being ventro-median looking forwards and slightly downwards. The embryos were normal except for the eyes, nose, and mouth. Some had a rudimentary eye and some no eye. Stockard emphasized the fact that the various degrees of eye defect were not different stages in an embryo, but represented different embryos. The cyclopean defect is foreshadowed in its final condition when the optic vesicle first separates itself from the brain. After separation of the normal from the cyclopean embryos, the former never exhibited cyclopia later, though kept in the magnesium solution. No subsequent fusion of the two optic vesicles or cups took place after that time (time of the first appearance of the optic vesicles). The cyclopean fish hatched more slowly, but they appeared to see, and lived as long as the yolk sac lasted (ten days in two cases). The optic outpushings appeared at thirty hours, when the brain was still a solid mass of cells without a central ventricle. This is important in view of Dareste's theory, already quoted. All teleosts should be cyclopeans, if Dareste's theory were correct. Stockard refers, in this connection, to Spemann's observation of his cyclopean tritons with an open neural tube, which is likewise inconsistent with Dareste's theory.

In order to remove all possibility of acting upon the eggs before segmentation had begun, Stockard applied the magnesium solution at later times and found that he could produce cyclopia at the thirty-two cell stage. This effectually put an end to the theory of the germinal origin of this monstrosity.

Stockard (115) at this time (1909) corrected his earlier impression that "the fusion of the two components may take place at different periods," and insisted that "no fusion of the eyes takes place after they are once clearly given out from the brain." This statement deserves emphasis, for it marks a radical departure from the position held by preceding writers on cyclopia, a position to which even Spemann (106) appears to have returned recently. The great contribution of Stockard is the definite and conclusive proof that cyclopia is not a fusion of two eyes as a result of the loss of intervening non-ocular tissue; but a failure of separation of the original optic anlage with the result that non-ocular tissue cannot find a place to develop in the midline. One of the last words of Mall (64) before his untimely death was an enthusiastic statement of this positive contribution to exact embryologic knowledge which he credits to Stockard.

The question immediately suggests itself as to the explanation of the astonishing effect of magnesium salts upon the embryo. Stockard has avoided dogmatic utterances all through his writings. He merely suggests that magnesium is known to exert an inhibitory effect upon muscle tissue and to be anesthetic to both vertebrate and invertebrate animals.

He thinks that this anesthetic effect accounts for the lack of energy on the part of optic vesicles to push out to lateral positions, which in its end result is equivalent to a pressure from without. Pursuing this idea of anesthetic effects upon nervous tissue, Stockard (117) experimented with alcohol, ether, and chloretone, and found the latter two produced general retardation of growth, while alcohol and magnesium were more localized and specific in their action. Alcohol produced from 90% of 98% of abnormal eyes, usually cyclopean; only a few of the fish developed to hatching and could swim. In one series, 5% alcohol in sea water produced 146 ophthalmic monsters with only three fish with two separate eyes. It appeared that magnesium affected chiefly dynamic processes such as the outpushing of the optic vesicles. Only anesthetics produced eye defects in Stockard's experience. Other salts and sugar solutions failed.

Stockard's observations naturally give rise to speculation in regard to the possible production of monstrosities in the human embryo by means of substances circulating in the mother's blood. Hertwig (38) raised this question in 1896. Mall (63) and Stockard (114) suggested the possibility that the tendency of a woman to produce monsters might be lessened by correcting uterine disorders and removing toxins from the maternal blood. Beck (11) has advised against the use of mineral salts and alcohol in pregnancy. The older experiments of Chas. Féré (26), a pupil of Dareste, had the advantage of dealing with such teratogenic agents as might operate in the human body. He injected into the chicken egg solutions of various alcohols, tetanus toxin, toxins of swine plague, bacillus pyocyaneus and hog cholera, and products of human tuberculosis. All of these substances increased the number of monstrous embryos to a high degree, as compared to controls. He found a direct relation between the toxic and teratogenic power of these poisons. In general, the gravity of the defects increased with the intensity and duration of the disturbing cause. Agents which had a teratogenic effect on the embryo in an early stage had a pathologic effect in a later stage. This observation accords well with Mall's belief in the essential similarity of pathologic ova and small monsters. While the possibility of preventing monstrous births in the human race by the application of experimental knowledge such as Féré and Stockard have contributed is not yet a reality, it is perhaps reasonable to hope that practical results may be attained in the future. Such an event would be a happy outcome of a variety of study which has been far removed from the realm of the practical.

IX. THE CLASSIFICATION OF CYCLOPIA.

Isidore Geoffrey St. Hilaire (121) was the first to show that monsters conform to some definite order and can be classified as Linnæus classified plants. According to his classification cyclopia belongs to the family of "cyclocephaliens" in the order of "monstres autosites," and has subdivisions according to the portion of the face involved, as ethmocephaly, cebocephaly, rhinocephaly, cyclocephaly, and stomocephaly. Gravelotte (31) modified this classification, making one general division of monstrosities to include arrests of development of the first cerebral vesicle, including typical cyclopia, atypical cyclopia and anophthalmia. Of typical cyclopia he described 5 degrees which are similar to the description of Bock already quoted.

Ballantyne (9) presented a logical classification slightly modified from Taruffi (123). His two chief divisions are monosomatous and polysomatous monsters. The latter include the various kinds of twins, triplets, etc. The monosomatous division is subdivided into pantosomatous, merosomatous, and heterotaxic. Cyclopia is a merosomatous monster and, in the language of the most common and generally accepted classification of "monstra in excessu" and "monstra in defectu," of course cyclopia comes in the latter division. Adami (1) and Stockard (115) feel that this simple division of monstrosities into two broad classes is convenient and sufficient. Of the monsters in defectu, Stockard (115) makes two subdivisions: (a) certain organs fail to complete themselves, as in cleft palate, hair lip, and faulty heart development; (b) certain paired organs occur singly or without mates, as in cyclopia.

Adami's Growing-Point Hypothesis.

Adami (1) has attempted to obviate the difficulties in classification by means of a single hypothesis, relating to the so-called "growing points" of the embryo. Fischel has stated that the head and trunk centers are formed early in the embryo and that from these two centers the entire individual is derived. Adami discussed the method of growth in plants from two primary growing points, the superior giving rise to the stalk and appendanges, the inferior giving rise to the root, all parts being derived from these two. Mother cells give off daughter cells which persist as a vegetative layer; other cells given off at right angles to the former plane become functional cells of the stem and root. Secondary growing points occur. According to this explanation, Fischel's head and trunk centers are the superior and inferior growing points. These, once formed, do not grow but are projected apart. Successive daughter cells given off from these give origin to different segments of the body and their contained tissues, some daughter cells becoming secondary growing points for lateral organs. Assheton (4, 5) has demonstrated the superior and inferior growing points in the rabbit, frog, and chick. He found that the brain, medulla, heart, and foregut develop from the superior growing point, and all the rest of the body from the inferior. In animals the primary growing points cease to function as soon as the anlage or matrix of the main axis is laid down. Further increase in length is only by intercalation. If this were not the case there would be a mass of tissue with no function, as happens in epignathus and congenital sacral teratomas. These tumors are of epi-, meso-, and hypoblast, since they originate early in embryonic life before differentiation has occurred. Epignathus projects from the mouth, originating at the sella turcica where the superior growing point is located in the developed organism; congenital sacral teratoma is similarly located at the inferior growing point in the perineal region behind the rectum. Adami thus gives the first logical explanation of the location of so-called "fetal inclusions." His hypothesis is quoted freely here because of its general acceptability to teratologists, for whom it explains many difficulties, and because of its application to cyclopia in the light of Stockard's work. Adami would explain cyclopia as an abnormality of defect, being a "polar hypogenesis," "due to premature exhaustion of the growing point, or arrested growth of the same, at a period when the mother cells for the superior portion of the body and most of the head have been given off. It is not that the lateral parts undergo fusion in the midline, having crowded out and arrested the growth of the more median superior regions; those regions have never developed, and the lateral parts have never been other than in apposition." Adami's hypothesis has the virtue of simplicity and it explains many questions of teratology which are not adequately accounted for by the various complex theories which have been advanced from time to time. Moreover, it has certain definite anatomic facts to substantiate it, the "growing points" having been localized in some animals. Stockard (118) does not accept it in detail, but acknowledges the value of its application to cyclopia where it accords with the facts of experiment. The "exhaustion of the growing point" is substantially the same conception as Stockard's "anæsthetic" action of magnesium salts and alcohol upon the fish embryo.

Cyclopia belongs, therefore, among the "monstra in defectu," being due to arrested development of the region of the superior growing point of the embryo, a "polar hypogenesis," as a result of which the optic tissues do not push lateralwards and become separated into two eyes.

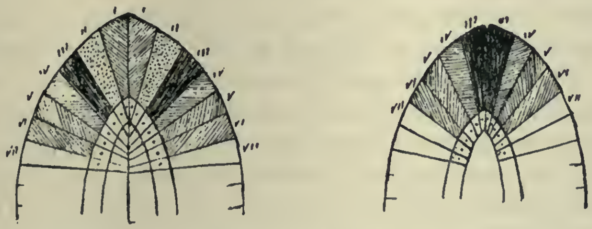

FIG. 4.—To illustrate Adami's "Growing-Point" Hypothesis as applied to cyclopia. 1. Represents the normal, the black portion (III) being the optic tissues after lateral extension. 2. Represents the cyclopean defect, the intervening median portions (I and II) being absent. (After Adami.)

X. PROBLEMS OF NORMAL EMBRYOLOGY.

1. *The Position of the Optic Anlage.*

The most important question in the embryology of the eye which has been clarified by the study of cyclopia is the question of the original position of the eye-forming material in the primitive nervous system. Huschke (44), in 1832, stated that the eyes are primarily single and push out from a median position, separating into two eyes. He apparently did not distinguish sharply between the anlage of the eyes and the rest of the forebrain. Dareste (20) quoted Huschke without disapproval, but nearly every later writer on cyclopia has contradicted Huschke, sometimes with scant courtesy. In general his theory has been dismissed as not in accord with newer embryologic facts. On the supposition that the eyes are originally lateral, cyclopia has been regarded as a fusion of the eyes resulting from the absence of intervening tissues. Emphasis was thus laid upon the nonocular tissues. Experimental injury to the eye-forming material in the medullary plate at very early embryonic stages revealed that the eyes themselves are at fault and that cyclopia exists before the eyes separate from the brain. Spemann (105) was thus led to abandon the theory of fusion after this separation has taken place, and postulate a fusion within the medullary plate before the eyes have pushed out. In his latest papers he opposes Stockard's conclusion that the eye is originally median, though his own experiments seem consistent with this conclusion. Stockard (118) and Mall (64) have both confessed their inability to follow Spemann's reasoning. Lewis's (59) experiment of removing median tissue with a needle and getting cyclopean eyes would favor the theory of a fusion brought about by the absence of intervening non-ocular tissue. Stockard (115) suggests, however, that ocular tissue may have been injured in these experiments. A strong argument against the theory that non-ocular tissue is primarily at fault allowing the eyes to fuse, is the fact that the cyclopean eye is smaller than two normal eyes. If the eyes are not at fault originally they should equal the sum of two eyes when fused. Stockard has proved that the cyclopean condition is present at the earliest stage at which it can possibly be recognized; that there is no evidence that eyes which have once been separate have fused later; that cyclopia exists when the eyes are still closely attached to the brain; that the cyclopean eye comes off from the brain in its final condition.

So convincing was the accumulated evidence in favor of the median position of the anlage that Stockard (118) carried out a series of experiments on the salamander *Amblystoma* *punctatum*, cutting out portions of the medullary plate to determine just what part of this plate is essential to the production of eyes. After removing lateral portions of the medullary plate in thirty embryos he found that twenty-four developed both eyes while six showed absence of one eye. In only one of these were both eyes absent; in this case the cut was more median than was intended. Nine embryos had a narrow median strip removed from the anterior portion of the medullary plate. Four showed entire absence of the eyes. In four others the eyes were highly defective. In one embryo the eyes approached a normal condition; in this case the strip of tissue removed was exceedingly narrow. It is to be noted that the removal of a median strip should produce cyclopia, according to the theory that this deformity is due to the absence of tissue between the anlagen of laterally placed eyes; but cyclopia did not occur. Stockard concludes: "the eye anlage in the medullary plate occupies an antero-median position as shown by the various abnormalities incurred when this region is cut away. The failure to injure the development of the eyes in the great majority of cases where the lateral portions of the medullary plate are removed by operation indicates further that the eye anlagen do not occupy lateral positions during this stage of development." Stockard discusses, further, the necessary development of the optic stalks on the assumption that the eyes are originally lateral. As the walls of the neural tube mount up and brain tissue comes to lie below the original lateral aspect of the medullary plate, the optic stalks would necessarily be within the brain and not below it, a condition which never occurs. The evolution of the neural tube, leaving the optic nerves and chiasm below and outside the brain, is only possible if the eye-forming material is originally median, occupying a position in the medullary plate which is not disturbed by the development of the lateral tissues as they grow upwards.

Thus, the logic of the situation and experimental facts support Stockard's belief that the tissue from which the eyes develop is originally in the midline of the medullary plate at its anterior end. Mall (64), in his last contribution, states that Lewis told him that only a few cells separate the eye anlagen in the midline. The difference between Lewis and Stockard, after all, is a question of the most minute histology of the early embryo, and whether we shall speak of the "anlagen" separated by a few cells or the "anlage" of the eyes, the fact seems clearly established that the eyes originate from a primordium median in position in the medullary plate and not lateral.

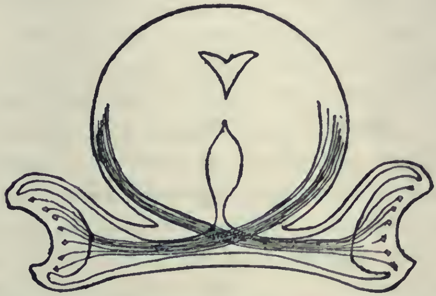

FIG. 5.—A diagrammatic cross section through the brain and optic cups of an early embryo, with all of the median ventral medullary tissue represented as being part of the optic stalks. The future fibers of the optic nerves follow the optic stalks to the median plane where they cross and afterward enter the brain to pursue their course as the optic tracts. The optic cross is entirely beneath and outside the brain. (After Stockard.)

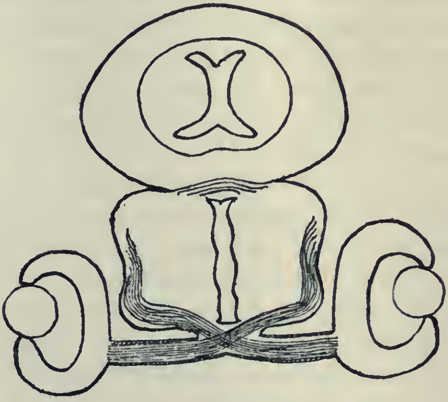

FIG. 6.—A sketch representing the actual outlines of a cross section through the brain and eyes of a late fish embryo. The optic nerves cross below and outside the brain and are surrounded by cells derived from the original optic stalks. (After Stockard.)

This fact is exceedingly important for the understanding of cyclopia and of the normal infracerebral position of the optic nerves and chiasm in the mature state.

It is to be observed in all deductions from experimental work that precisely the same conditions cannot be postulated for widely differing species. All human embryology suffers from this element of uncertainty because our knowledge is based largely upon the study of lower forms of life. It may fairly be said, however, that in the early stages of embryonic life there is a practical identity in the various species, and the criticism to which much of animal experimentation is liable does not apply to deductions from embryologic study. However widely adult human eyes may differ from those of fishes, the early embryonic status of the neural tube and the anlagen of organs developing from its anterior extremity must be practically identical throughout the vertebrate realm.

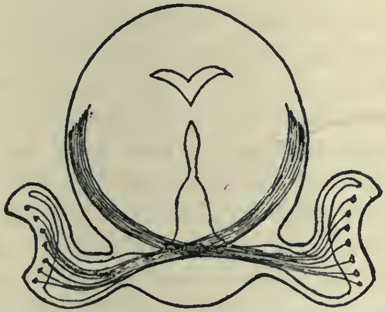

FIG. 7.—A diagrammatic cross section through the brain and optic cups in an imaginary case in which the optic connections are lateral with median brain tissue originally lying between the eye anlagen. The future optic fibers growing along the optic stalks as paths reach the lateral points on the brain from which the stalks arose and then enter the brain tissue before having formed the cross. Continuing to grow, the optic nerves meet and cross in the median plane. The cross is within the brain itself and lies above the median mass of tissue which has always existed between the eyes. No vertebrate brain exhibits such a condition. (After Stockard.)

2. *The Origin of the Optic Nerve.*

It is no doubt generally believed that the optic nerve is derived from the ganglion cells of the retina. This is a logical conception in accord with the facts of neurologic anatomy, viewing the optic nerve as a sensory nerve transmitting impulses to the brain, or as a cerebral tract (which is more correct), representing a sensory neurone of the third order. There is not, however, a unanimous opinion in the literature. As late as 1904, Mayou (66) described the retina and optic nerve of an ancephalous specimen and concluded, from the faulty development of the nerve fiber and ganglion cell layers of an otherwise normal retina, that the axis cylinders constituting the optic nerve are derived from cells of the primary optic centers and not from the retina. The older anatomists apparently held the same opinion. Jaboulay (45) reviewed the subject in 1886 and referred to the quadrigeminal bodies as the source of the optic nerves in the writings of Morgagni, Winslow, Zinn, Gall, Magendi, and Meckel; the quadrigeminal and geniculate bodies, in the opinion of Sappey and Huguenin. Marshall and Kolliker thought that the nerves are centrifugal. Some of the textbooks merely state that the optic stalks give rise to the nerves.

Jaboulay (45), in his important monograph, called attention to the value of cases of anencephaly on the one hand, and of microphthalmos with normal brain on the other hand, in clarifying the subject. He quoted Pierrot's conclusion that the optic nerves have a certain autonomy as exhibited in anencephaly with intact optic nerves. Jaboulay found that normal optic nerves did not occur with microphthalmos and anophthalmos, though a normal brain existed. He concluded that the retina exerts a trophic influence upon the nerve. Oakden (85) studied two anencephalous fetuses, using normal eyes of fetuses of the same age as controls. He found no wide departure from the normal; the nerve fiber layer of the retina was thinner in the brainless cases and the ganglion cells were fewer. Manz (65) stated that the eye in anencephaly differs from the normal only in the absence of nerve fibers from the optic nerve and retina. Vaschide and Vurpas (126) found a normal retina in an anencephalic cyclopean monster. The careful staining methods used by these authors make their observation valuable. Lewis (57) transplanted the optic vesicles of amblystoma into an abnormal location in the same embryo and into older embryos and found that optic nerve fibers developed. Similar experiments on rana palustris gave the same result. Stockard (117) found that abnormal eyes of fundulus, disconnected from the brain, grew nerve fibers which passed through the pupil, taking the path of least resistance according to Stockard's suggestion.

Following the well-known investigations of Cajal, authors have very generally accepted the retinal origin of the greater portion of the fibers which constitute the optic nerves. The standard textbooks state that these nerves are centripetal, originating from the ganglion cells. The more elaborate statements refer to smaller numbers of centrifugal fibers in addition to the preponderant visual fibers which are centripetal. Thus, Piersol says that there are (1) fibers going towards the retina, originating in the brain from cells of the primary optic centers or from sympathetic neurones, which probably carry vasomotor impulses to the retinal blood vessels; and (2) perhaps fibers by way of a center in the medulla pass from the retina and may convey indirectly to the third nerve nucleus the impulses resulting in pupillary movements.

The observations upon anencephalic specimens are extremely variable. Unquestionably some of the lower vertebrates can develop a perfect optic nerve in the absence of a brain. There is, in other words, an autonomy possessed by the retina. In higher forms it is scarcely possible that the embryonic nervous system can be so profoundly altered within very narrow limits that certain parts are destroyed while adjacent parts escape entirely. It is not reasonable to expect a perfectly normal retina in anencephaly. It is much more probable that the nerve fiber and ganglion cell layers of the retina share in a widespread damage to the nervous system than that they fail because the primary optic centers are absent. With this conception in mind, one is not surprised at the variable case reports in the literature. The retinal damage may be very little or very great. Where there is but little diminution in the size of the nerve trunk and the nerve fiber layer of the retina it may be possible that the centrifugal fibers alone are absent as a result of failure of the brain tissues which give origin to these fibers.

The evidence obtained from the study of poorly developed eyes with normal brains, and of well-developed eyes accompanied by extensive brain defects, points to the dependence of the optic nerves upon the retina rather than the brain. Eyes with grave developmental defects do not have well-developed optic nerves, however normal the brain may be; eyes which approach the normal, even with the defects inherent in cyclopia, often show a partial development of the optic nerves which occasionally approximates the normal. While it cannot be claimed that conclusive proof of the retinal origin of the optic nerves is obtained from a study of monstrous eyes, it may be stated that the evidence is consistent with the logical belief that these nerves, in so far as their preponderant visual fibers are concerned, are the outgrowth of the ganglion cells of the retina.

3. Self-Differentiation of the Crystalline Lens.

The crystalline lens is a peculiar structure in many respects. Apparently it has not always had an intimate relationship with the eye, but was once an independent organ, perhaps sensory or designed to focus light upon the brain wall before the eye was evolved as a separate visual organ. Originating outside the optic cup and eventually coming to occupy an intra-ocular position, its dependence upon the influence of a surface ectoderm and an optic cup seems evident. The old idea that the lens pushes the optic vesicle before it making an optic cup scarcely needs mention as it is generally discredited. Lewis (58) expressed what is perhaps the most generally accepted view when he said that "the lens is neither self-originating nor self-determining, but is dependent for its origin, its size, its differentiation, and its growth on the influence of the eye." He found that in rana sylvatica the optic cup gave rise to a lens from its own tissues if prevented from stimulating a lens from the ectoderm of the body wall. In rana palustris, on the contrary, optic cups failing to come in contact with the ectoderm did not form lenses. Stockard (116) did not find lenses when the optic cups were deeply buried away from the ectoderm, in fundulus. There is evidently a difference in various species in the ability of the optic cup to develop a lens from its own tissues. The well-known tendency of salamanders to form a new lens when the old one is removed or pushed back into the vitreous, or the iris injured, is not shared by most animals. Applying his theory of dependent lens formation to cyclopia, Herbst (36) said that "if the lens really developed independently of the optic cup then in the case of median cyclopia the two lateral lenses should arise in their usual positions; but they do not, and furthermore the cyclopean cup gets a lens from ectoderm out of the usual lens-forming region." Spemann and Mencl (69, 70, 71) have discussed the problem of the crystalline lens in numerous valuable contributions.

Spemann (101) and Lewis (56) concluded that no localization of lens-forming material occurs in any given area of ectoderm, but that lens formation is due to stimulation of ectoderm through contact with the optic vesicle or cup (in amphibians). Spemann (106) found later (1912) that several varieties of frog produced lenses independently of an optic cup, and suggested that King's (49) experimental animals might have shown lenses if they had been allowed to live longer. King had concluded that the lens, in rana esculenta, was entirely dependent upon the optic cup. Stockard (115, 116), however, showed in fundulus that lenses occurred without a trace of an eye, that lenses occasionally appeared in the usual lateral position when the eye was median; and one of his specimens was an incomplete diprosopus with three eyes and one additional lens. He also found that the size and shape of the lens were often out of accord with that of the optic cup; the smallest trace of an optic cuplike structure sufficed to develop a lens if in contact with the surface ectoderm, though this ectoderm was far removed from the usual lens-forming area. Stockard concluded from these observations that the lens may be self-differentiating but that the optic cup exerts a much stronger influence for the production of a lens than the innate tendency of the ectoderm to produce an independent lens. Therefore, he believes that the injury done to the ectoderm in removing the optic vesicles by experimental methods may be sufficient to destroy the limited capacity of the ectoderm to form a lens; he would not conclude from such experiments that the ectoderm, uninjured, has no power to produce a lens when the optic vesicle is removed. Stockard (118) found the separate lenses in cyclopean fishes to be anterior to the eye most often. The lens-forming power would seem to diminish from the anterior tip of the head, backward. The trunk ectoderm did not give rise to lenses. Spemann (106) likewise failed to get lenses from the back ectoderm of frogs by transplanting the optic anlage to this location.

Stockard's conservative statement, based on the large material observed, may be accepted as a fair conclusion. The crystalline lens possesses a certain degree of independence, perhaps a relic of its original separate existence. It is most often, however, found in intimate relation to an optic cup whose power to stimulate lens growth in overlying head ectoderm is much greater than the tendency of the ectoderm to grow a separate lens.

XI. CONCLUSIONS.

Cyclopia is a monstrosity of the type known as "monstra in defectu," being the result of a failure in development of the anterior end of the embryonic nervous system. According to Adami, this may be considered a superior polar hypogenesis affecting the region of the superior growing point of the embryo.

Cyclopia is not a germinal defect, but is a developmental defect resulting from some detrimental influence acting upon the embryo after cell division has begun. The damaging agent seems to act by exerting an inhibitory or anesthetic effect upon the embryonic nervous tissue.

Dareste's widely accepted theory that cyclopia is the result of a premature closure of the anterior orifice of the neural tube has been abundantly disproven. Amniotic bands as a cause of cyclopia are, in the words of Mall, a myth of teratology.

In lower forms of life the cyclopean defect may be sharply delimited, but in man and the higher vertebrates it is part of an extensive defect of the nervous system which may appropriately be termed cyclopcephaly.

Cyclopia is not the result of a failure of intervening non-ocular tissue to develop, allowing two lateral eyes to come together. It is the result of damage to the eye-forming material in the medullary plate, by which separation and lateral extension of the eyes is prevented. The failure of non-ocular tissue to develop is the result and not the cause of cyclopia.

The study of monstrosities and pathologic ova offers hope that these calamities can be prevented if pathologic uterine conditions and substances in the maternal circulation which are toxic to the embryo are removed.

The study of cyclopean eyes and experiments suggested by this study indicate that the eye-forming material is median and not lateral in the anterior portion of the medullary plate of the embryonic nervous system. Practically, a single optic anlage exists, from which two eyes develop by lateral outpushings. Whether a few cells in the midline intervene between the two halves of this anlage, according to Lewis, or no such separation exists, according to Stockard, is a question of little practical importance.

The logical opinion that the optic nerves originate from the ganglion cells of the retina rather than from cells of the brain is strengthened by the study of cyclopean specimens in which the brain is absent or rudimentary.

The study of cyclopean eyes in lower vertebrates indicates a degree of independence on the part of lens-producing ectoderm of the head end of the embryo. This self-differentiation of the crystalline lens is, however, a much less potent factor than the influence of the optic vesicle upon lens production.

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PERIMETRIC METHODS.

A DISCUSSION AT OXFORD OPHTHALMOLOGICAL CONGRESS, JULY, 1920.

BY DR. P. G. DOYNE.

DR. LUTHER C. PETER (Philadelphia) contributed the opening paper. The laboratory and the consulting room are distinct entities, methods which are employed in the one are not necessarily applicable in the other. For the consulting room the method must be practical, easy of application, and reasonably speedy. With advancing knowledge the mere silhouette of the field is not sufficient and it is necessary to use methods which accurately delineate the changes peculiar to the central zone. The tangent plane is now the instrument of choice in all central field studies. It is admitted that an error may creep into the findings between the 20 and 40 degrees areas if a movable stimulus is employed this error is so small as to be negligible. One of the most marked advancements made in the tangent plane is its use in certain studies at close range. The Peter hand campimeter—in this instrument the average normal blind spot of Mariette is placed and outlined on the screen and it is advised that the study should begin by the outlining of the normal blind spot; the advantage of this procedure lies in the recognition of unsuspected cases of enlargement and in the training in concentration which the patient receives. Gradle's laboratory screen—this instrument is operated at a distance of sixty centimeters and a second point of fixation is interposed midway between the patient's eye and the fixation point on the board. The average normal blind spot is marked out and the test objects consist of metal balls of definite sizes which are moved by a magnet from behind the screen. This instrument is, however, too technical for ordinary practice.

The Bjerrum method of study at one meter radius is most suitable for examining small scotomata which elude accurate study at close range. Lloyd's stereo-campimetric slate—this is an admirable instrument, accurate and expeditious. Elliot's Scotometer—this is in many ways a practical instrument, but is liable to error if not used with extreme care. The fact that the movement is circumferential only makes for inelasticity and there is a tendency for the production of sharp angles. The screen is excellent but the test objects might with advantage be larger.

Though the circumferential movement is preferable to the radial, yet the outstanding advantage of the tangent scale is the freedom of the movement obtained by using a hand-manipulated test object.

Regarding the distance of the eye from the test object; there is, in favor of the short range, the sharper definition of the test object, the prompter recognition of color tones, and the ease of concentration on the point of fixation. It is of course essential for the patient to wear his correction for ammetropia or presbyopia, should any exist.

At the longer range, one meter and upwards, the differences between the central and peripheral zones are more pronounced; to compensate for this it is advised that a slight movement be imparted to the test object when exploring the peripheral zone. When working at one meter—and longer distances are not advised—there is no doubt that greater accuracy can be obtained in marking out small scotomata, provided that the test object used subtends the same angle as subtended by the test object employed on the smaller scale. Considering the test object; it is desirable, in view of the number of perimeters and screens with differing radii in use, that the object should be named by reference to the angle which it subtends at the eye, rather than by its linear measurement. The tendency has been to use too small a test object. For central zone work the test object should subtend an angle of one half a degree, and for the peripheral zone an angle of two degrees. This should suffice for colors also. It has been shown by many workers that a big drop in visual acuity occurs in the zone immediately outside the fovea, particularly in regard to color sense; consequently it is unsatisfactory to use the same stimulus for the two regions.

Regarding the exposure of the test object to the eye, it is desirable to pass the object from invisible to visible areas and when testing the periphery to impart a slight vibratory movement to it.

The following are the probable important changes which will be incorporated in future methods:

1. Perimetry will be largely practiced on the tangent scale.
2. Light standardization; (the "Daylite" lamp unit is advised).
3. The central and peripheral field will be studied by a stimulus moved by hand.
4. Pre-exposure and the surrounding field will be equal in brightness to the stimulus employed.
5. Determination of the threshold values of different parts of the retina in health and disease by means of light standardization, with photometric measurements made possible.

The central vision is absent in one eye, but the muscle balance is good, Lloyd's stereo-campimetric slate is the instrument of choice; but when one eye is totally blind, squint or muscle imbalance is present, or when both maculæ are involved, field taking requires special technique. The following method is suggested. The patient is seated at the perimeter, with the arm of the instrument in the horizontal plane. He is told to look along the arm until the fixation spot becomes visible, the number of degrees that the eye has been rotated is found by taking the corneal reflex as in a squint. This process is repeated in the four cardinal directions of the eye. The four points, so determined, mark the border of the central scotoma. They can be placed on the screen and used for fixation and the rest of the field studied.

E. Marx (Leyden): The ideal method for performing scotometry is one in which all extraneous stimuli are excluded as far as possible. The following method is brought forward as one in which only the essential stimuli are placed before the patient and one which is easy and practical in its use and application. A large black cloth 4 ft. by 6 ft., of dull woollen material is used as a screen. The fixation point is attached at a height of 4 ft. 4 in. from the ground; on the side of the screen away from the patient circles and radii are marked out; the patient is seated one meter from the screen. Eight or ten small holes, a few millimeters in diameter, are made in the cloth at the height of the observer's eyes, through which he can see the patient. The test objects are small steel balls of varying diameter which the observer manipulates from behind the screen by means of a hand-magnet, marking on the back of the screen the outline of the scotoma.

In cases where there is a central scotoma, it is necessary to enlarge the fixation point to a more or less extensive fixation field. It is better to have a white ring surrounding a black center than to merely enlarge the usual white fixation point, as tests can be made inside the ring. Experience points to the fact that persons with central scotomata can keep their gaze fixed in the center of a white ring, the size of which varying with the size of the scotoma.

By observations on the artificially produced scotoma of the dark-adapted eye in normal persons, this factor was proved.

The subject, having been for a certain time in a dark room, was placed before a ring covered with luminous paint. In the center of the ring there was an instantaneous shutter and behind the shutter a Nernst lamp with a vertical filament. As the subject is attempting to fix the center of the ring, the shutter is opened for a fraction of a second; a sharp after-image is thus produced which the subject then draws on a previously prepared paper with a dark fixation point. By this means it is possible to find out how far outside the center of the luminous ring the eye has fixed. The error has never been found greater than one degree fifteen seconds in any direction.

Professor Van der Hoeve (Leyden): It is necessary to make our methods as good as possible for quick examination. Hasty perimetry is worse than useless, yet with our present instruments there is often not time for their systematic use in the clinic.

There is a tendency for the size of the test object employed to be too small. The only rational method of outlining a scotoma is to approach its boundaries perpendicularly with the test object, but the presence of the scotoma must be first elicited. The following is a good method to employ: Carefully map out the blind spot; encircle this in two or three circles, the first circle very close to it, the others at some distance from it, then ramble with vertical movements all over the region from fifteen degrees on either side of the fixation point and the same distance vertically.

He agreed that Seidel's sign was very important in the early diagnosis of glaucoma, but often the earliest scotoma appeared at the median raphe and Bjerrum's arcuate scotoma might be complete except for the area immediately adjoining the blind spot—a negative Seidel's sign. Bjerrum's scotoma hardly ever began all at once, usually scotomatous islets appear along the course of the bow, eventually joining up. The scotoma might be absolute or relative in part or in whole.

He protested against the view that a bridge was present between the scotoma and the blind spot in every case of scotoma caused by disease of the optic nerve.

DR. SINCLAIR (Edinburgh). He was disposed to say that the perimeter should not be ruthlessly cast aside. It was usually badly made. The test object should be moved by hand and the use of the instrument should be limited to the mapping out of absolute scotomata and the limits of the visual field. He urged the importance of the small test object for white, for colors a larger test object was necessary. With regard to the screen he preferred the two-meter screen for delicate work. The screen was of value for central zone work, but not for the periphery. It was especially valuable for detecting early relative defects in the central zone. He advocated moving the test object from blind to seeing areas and vice-versa. He emphasized the importance to general medicine of the findings of these tests.

PROFESSOR HARVEY CUSHING (who was asked by the Master to join in the discussion). After some introductory remarks he pointed out that all were striving to produce instruments of precision. Not so very long ago a similar discussion was taking place among physicians regarding different kinds of thermometers. The introduction of these instruments meant the taking of more and more time in the clinical examination of the patient. It was necessary also that an instrument should be produced which was more or less fool-proof. Changes in the periphery of the field were at present of most direct importance to brain surgeons. He would mention the temporal lobe. He would point out how far forward the visual pathway went in the temporal lobe, so that any lesion in this lobe would be likely to produce an homonymous defect in the fields. Curiously that defect always came first on the same side as the lesion, and it might advance as far as a quadrangular defect before any defect appeared in the opposite field at all. In the case of temporal lobe tumors one could tell by bilateral changes in the field whether the tumor was high or low because these paths showed the same kind of course through the brain.

It was necessary that there should be some form of field taking applicable to all patients and which could be used whether the patient was sitting up or in bed. He hoped that as the result of this discussion something would be evolved which could be passed on to those who, while not being specialists, were interested in ophthalmology.

Dr. S. Holth (Christiania): In testing the peripheral fields, the object must not be moved too slowly for then it may not be observed, though no actual scotoma is present; conversely if moved too fast a scotoma may be missed. In testing the periphery of the field the perimeter is indispensable, the ordinary models, however, are too cumbersome, especially for travel and the sick-bed.

The Holth Chord Perimeter.—This instrument meets these requirements and in addition there are superadded to the instrument a sensitive test for central scotoma and a centimeter-diopter measure.

The instrument consists of two rules, 27.5 *cm* long, connected at a right angle by a joint which forms the fixation point. The chord graduation occupies 25 *cm*. Two metal sticks, attached to the rules, when at right angles have their connecting point in the center of the half circle. The test object is moved by hand along the rules.

On the outer side of the rules, groups of three celluloid disks, in pink, red, and white, are placed. The patient fixes the middle disk of the three and the rule is held first in the horizontal and then in the vertical position. A comparison of the relative light and color values of the three disks can then be made.

The two chords can be straightened and fixed and so converted into a centimeter-diopter measure.

Mr. E. H. E. Stack (Bristol) emphasized the importance of having a moving disk instead of a fixed one for ordinary perimetry and of the necessity of working from blind to seeing areas as well as in the opposite direction. He advised routine 4 or 5 point perimetry to be performed by the sister or assistant in the clinic. By this routine procedure unsuspected cases, needing detailed perimetry, were often discovered.

Lieut.-Colonel Elliot (London) wished to confine his remarks to glaucoma. He had evolved his present scotometer while studying Seidel's sign. Scotometry was of value in glaucoma in three ways:

1. Diagnosis in early cases.
2. Following the progress of a case.
3. In the estimating the value of treatment.

He maintained that his instrument, while not necessarily a laboratory instrument, was a practical instrument for clinical purposes. By 26 rapid and precise observations the field could be accurately delineated out to the 26 degree circle. He wished to insist on the importance of accurate fixation of the head so that the eye remained in the center of the system of circles under examination. He regarded Bjerrum's principle of enlargement of the scotoma as of the greatest importance. It seemed to him unreasonable to expect that the enlarged blind spot should always end in pointed extremities. It was more reasonable to suppose that the resulting scotoma would be frayed out into a number of points, owing to the fact that certain nerve bundles would be more damaged than others as they flowed over the scleral edge. The advantage of the circumferential method consists in the fact that one was following the path of the damaged fibers, as the path of these fibers is a circular one around the center of the retina.

With regard to the forms of the scotomata, one might find:

1. An enlarged blind spot with jagged edges above and below.
2. A single narrow arc-like belt continued along one or two degree circles only.
3. No enlargement of the blind spot but at some distant point a commencing relative or absolute scotoma.

Other varieties also could be found. The reason for these peculiarities lay:

1. The method of distribution of the nerve fiber bundles as they pass out of the papilla.
2. In ill-understood physical variations of the scleral edge causing a patchy lesion of the nerve fibers.

With his scotometer the observer can pass the test object from visible to invisible areas and vice versa. The scotoma would be most exaggerated if the test object was passed from invisible to visible areas.

DR. A. MAITLAND RAMSAY (Glasgow) called attention to the value of the spindle-shaped enlargement of the blind spot in sympathetic irritation. The value of the observation depended on the fact that after the exciting eye had been removed the blind spot resumed its normal shape. He placed great value on this sign in enabling him to determine when it was necessary to excise the exciting eye. He had found DR. PETERS' campimeter most useful in accurately and quickly making this observation.

MAJOR LISTER, I. M. S. (Lucknow) pointed out the value of a series of observations of the blind spot in estimating the progress of a case of glaucoma. Though modern instruments for scotometry were desirable they were not always obtainable, but it was possible by means of extemporized methods to take sufficiently accurate observations. He cited the case of a gentleman with glaucoma, who was filling a very important post in India. In this case, for reasons of state, it was most desirable to postpone operation, and by watching the size of the blind spot, using extemporized methods—a black billiard cloth and a piece of chalk—it was possible to watch the progress of the case with confidence.

MR. T. HARRISON BUTLER (Leamington) in using the ordinary Bjerrum's screen he measured the distances from the center with a Sinclair's tangent scale. He used a carpenter's rule to measure the angular distances. The best varieties of these have a scale of degrees at the pivot and by opening the scale one can apply it to the screen and transfer the reading to a chart.

MR. E. BURDON-COOPER (Bath) put forward his method of measuring the blind spot "longitudinally." Of two spots on a card one looked at the central one with one eye in such a way that the other spot fell on the blind spot of the eye. By approximating or receding the chart on a longitudinal bar two points could be found where the spot just appeared or disappeared. The longitudinal distance between these two points was a measure of the blind spot. In thirty seconds an accurate measurement of the blind spot in one diameter could be made.

MR. E. E. MADDOX (Bournemouth). It was necessary to have a rapid method for singling out cases for more detailed perimetric study. He used a white hatpin stuck into a cork for this purpose. Owing to the cylindrical shape of the cork, it can be held between the thumb and forefinger and a movement imparted to it without any chance of the movement of the fingers being seen. He considered it desirable to impart movement to the test object when examining the peripheral field.

MR. P. G. DOYNE (London) said that during the last few months he had made some observations on the blind spot in myopia, using sometimes Elliot's scotometer, sometimes Bjerrum's screen. The object which he had in view was to see if the enlargements of the blind spot, so common in myopia, might be a source of confusion in the estimation of the value of Seidel's sign. He had not yet taken sufficient observations to draw definite conclusions, but in some cases of myopia, in which there was no reason to suspect glaucoma, appearances very similar to Seidel's sign were obtained.

There appeared also to be no reliability in the estimation of the condition of the retina which overlay areas of atrophy or stretching, so common around the myopic disk. He had lately examined a case in which there was a large inferior crescent, about two papilla-diameters in extent, and yet no enlargement of the blind spot was found.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE

By Dr. CONRAD BERENS, Jr., Secretary

MEETING OF OCTOBER 18, 1920. DR. A. E. DAVIS, CHAIRMAN.

Doctor Martin Cohen and Doctor Ward MacNeal read a report of a case of **metastasis of carcinoma into an endothelioma of the optic nerve sheath** (complete report to appear in next issue).

Doctor A. E. Davis and Doctor H. V. Hubbard gave a report of two cases of **Coats's disease.**

Case 1.—Aged ten. Came to the clinic at the Post-Graduate Hospital September 18, 1920. Family history negative. The right eye was found defective in December, 1919. V. O. D. $\frac{4}{200}$ eccentric.

In the right fundus there is a large mass of white exudate, yellowish in some spots, under the retina, extending from the temporal half of the optic disk, upon which it encroaches, to the extreme temporal periphery of the fundus. The highest point of this mass measures + 8 about one disk-width to the temporal side of the disk. At this point some blood vessels extend from the mass into the vitreous. There are numerous hemorrhages on the surface of the mass near the macula, especially beyond the macula on the temporal side. Some of the vessels are dilated into a fusiform shape, as described by Coats. Numerous cholesterin crystals are scattered throughout the mass, especially at the margins of the exudate. One of the unusual features in this case is that one of the retinal vessels is veiled for a short distance in the lower portion of the mass. The vitreous and anterior portions of the eye are clear. T. n. The other eye is normal.

The subcutaneous tuberculin test was positive in all three phases, the changes in the eye-ground consisting in fresh hemorrhages.

This case belongs to the second group reported by Coats, with the massive exudation into the retina with marked vascular changes.

There is one feature in this case which has not been observed before, that is, the absence of the light streak on the retinal vessels over the massive exudate, or, if present, the streak is but very faintly to be seen. This corresponds to cases of ordinary marked detachment of the retina where no light streak is seen upon the retinal vessels; and, incidentally, it goes to confirm the theory that the light streak produced on the retinal vessels is due to refraction and not to reflection, a point that both Loring and myself contended for many years ago and in which I confirmed the experiments of Loring.

Another feature unusual in these cases of Coats's disease is veiling of one of the retinal vessels in the lower part of the mass, as in this case. Coats claims that this is a very rare condition.

The cause of the trouble still remains obscure. By many observers it is considered to be due to tuberculosis. Coats, however, was not inclined to this view and thought it due wholly to hemorrhages into the deeper layers of the retina. But as to the causes of the hemorrhages themselves he was not certain, and that, of course, is the point in the whole discussion.

DISCUSSION: DOCTOR MARTIN COHEN said the obliteration of the retinal light reflex in the artery as it coursed over the massive exudate was probably due to an obliterating endarteritis or a localized exudate. The massive exudate was evidently not due to a previous hemorrhage, as there were only a few hemorrhages seen in the periphery of the fundus, but none in the mass or its vicinity.

DOCTOR L. W. CRIGLER said that he had reported a similar case before the section in which he was fortunate enough to secure the eye for microscopic examination inasmuch as it became necessary to remove it on account of secondary glaucoma. His case differed materially from those described by

Coats in that there was very slight deposition of connective tissue beneath the retina. There was a progressive atrophy of the inner layers of the choroid and the outer layers of the retina. A coagulum filled the space between the retina and choroid in which there were deposits of cholesterin and clouds of "ghost cells." In every other respect, the case presented the identical changes described by Coats, classified under Group II.

Doctor Davis in closing said that the loss of the light streak in the patient was not due to endarteritis obliterans for the vessels were full of blood.

Doctor K. Schlivek presented a patient with **persistent hyaloid arteries.**

F. L., 9 years old, was sent from school on account of imperfect vision.

Vision $\frac{15}{20}$ each eye—with correction $\frac{15}{15}$.

O. D. There is a persistent hyaloid artery. It begins at the optic nerve, comes forward and close to the lens divides into three branches which subdivide dichotomously into several minute ones. They can be traced beyond the limits of the lens.

O. S. Almost the same condition but there are only two branches which subdivide and one small single branch.

Persistent hyaloid artery is not a very rare condition but the picture presented by this patient is unusual. The hyaloid artery generally is single; it begins at the optic stem and goes forward to the posterior pole of the lens. Here it divides into numerous branches which spread over the posterior surface. It also has some branches which supply the vitreous. There are several variations. Occasionally it may divide into two branches soon after leaving the optic stalk and rarely, as in this case, it may divide into three or four branches when nearer the lens.

Discussion: Doctor Claiborne said that he had reviewed the literature of this subject a number of years ago, and that his paper could be found in the Transactions of the Section. He said that the cases in which the arteries plunged forward into the vitreous humor towards the lens returning upon themselves and then into the optic nerve head, had been classified with the remains of hyaloid arteries. He thought this was an improper classification.

Doctor George H. Bell presented a patient with **Parinaud's conjunctivitis** in a physician, age 30, with marked swelling of both upper and lower lids; the conjunctiva was highly inflamed and the characteristic lesions were present consisting in large reddish polypoid vegetations. There was a mucopurulent discharge and also enlargement of the pre-auricular glands. The temperature was 101°. The condition for a time seemed to get worse with more swelling of the eye-lids and more glandular involvement. Ten days later, the pre-auricular gland was so swollen that it was opened and drained. The patient's temperature then ran up to 104° and continued high for three days. The parotid and sub-maxillary glands became more involved and very much swollen. The smear and culture from the conjunctiva showed only one variety of white staphylococci. The patient had no pain, and there was no involvement of the other eye.

The usual treatment for septic conjunctivitis was instituted and now after five weeks the edema of lids and conjunctiva has about disappeared. The granulations in the conjunctiva are gradually absorbing and the glands are all receding.

Discussion: Doctor Wolff said that a few months ago he had treated the five-year old son of a physician who showed marked granular swelling in the fornices and tarsal conjunctiva of both lids of the left eye. There were numerous ulcerated areas covered by a grayish exudate. The pre-auricular gland of that side was very much enlarged. The case was clearly one of Parinaud's disease. Pathological examination, inoculations into the peritoneum of a guinea pig and the anterior chamber of a rabbit's eye showed the case to be tuberculosis. After treatment for two months with x-rays, dusting with iodoform and frequent irrigations, the case was entirely cured.

Doctor C. E. McDannald in describing an **instrument devised for the removal of cataractous lenses in their capsules** said: In studying the method and instrument used by Dr. Barraquer for the performance of the operation designated by him as phakoerisis it occurred to me that a much simpler device could be substituted. With this thought in mind I visited a jeweler, and laid before him Dr. Barraquer's article with my suggestions as to the modification of the instrument shown in the half-tone cuts that were employed to illustrate his technique. I concluded to have made a suction tip resembling, as near as possible, the one employed by him in his demonstrations. This was accomplished by drawing down a silver tube until its smallest outside diameter equalled one and one half *mm.* It was then bent at an angle of about ten degrees, the end flared out and a suction cup fashioned two and one half by three *mm* and one half *mm* in depth. The tip which was four and one half *cm* long was then soldered in the end of a larger tube nine *cm* long. Six and one half *cm* from the end of the suction tip a four *mm* opening was made in the large tube. This hole was situated where the index finger could easily be slipped over it for the purpose of making and breaking the suction, in this way eliminating the valvular mechanism spoken of by Dr. Barraquer as being necessary for the proper manipulation of his instrument in applying and discontinuing suction. The metal tube was then inserted in the open end of a rubber connection tube which was attached to a number fifty Sorensen rarefication pump. I found that the finger when placed over the opening indicated for this purpose acted perfectly as a valve, thereby enabling me to control my suction at will without stopping the pump. I determined to try this instrument on the first docile patient I had for cataract operation. The case selected was one with a mature senile cataract and well sclerosed lens. The technique was the same as that which I have hitherto employed in combined extractions, namely a corneal section with conjunctival flap and iridectomy. The instrument was then introduced into the anterior chamber and placed in contact with the lens a little above the equator. The capsule was instantly picked up by the suction cup when the finger was slipped over the opening in the handle of the instrument. By means of a side to side and forward and back movement the lens was loosened in the patella fossa. The instrument was then lifted slightly forward, which elevated the corneal flap thereby allowing the brim of the lens to emerge from underneath the scleral border. After this it was easily withdrawn. The patient made an uneventful recovery with little or no reaction from the operation.

This is submitted purely as a preliminary report and will be followed later by a full account of the cases that I have treated by this method.

DISCUSSION: DOCTOR PAGANELLI said that he had seen Doctor McDannald's first operation and had also extracted a cataract using his instrument. He easily extracted the lens, although his section was small and had to be enlarged, necessitating reapplication of the instrument.

DR. KNAPP stated that he had watched some experiments several years ago to devise an apparatus whereby suction could be effected. The main difficulty proved to be the impossibility of shutting off the suction quickly enough. He believes that the large opening in the handle of Doctor McDannald's instrument would overcome this difficulty.

DR. M. J. LEVITT presented a patient with leprous keratitis of the superficial punctate type. S. R., 37 years old, suffered from keratitis punctata of the right eye in 1912; he was treated for 4½ months with K. I., atropine, yellow oxide, dionin, and regulation of diet, and made a complete recovery with $\frac{20}{15}$ vision. On June 15, 1920 he complained that the vision in the left eye had been blurred for two weeks. On examination there was slight ciliary congestion in the upper quadrant and to left of the cornea; there were numerous grayish-white dots and maculæ, some round, others irregular in shape, just beneath the epithelium, and a number of linear striæ; a network of minute, deep and superficial blood vessels resembling a brush, starting a little above the limbus and ending at the center of the cornea. At no time did the patient complain of pain or photophobia; vision was reduced to $\frac{20}{200}$ and the lower quadrant of the cornea was never involved.

The patient was born in Russia, came to New York 15 years ago, always lived in or around New York, was never exposed to leprosy; about 4½ years ago began complaining of itching about his left thigh and leg. On examination there was found present parasthesia of the left leg, thigh, and buttock; 8 to 10 brownish-red waxy-like nodules varying in size from a small pea to a ten cent piece; a few of these nodules were also present on the other leg and lower part of the trunk; he had alopecia of the eyebrows. A section taken from the lesion showed numerous lepra bacilli. Patient is now being treated at the Skin and Cancer Hospital with intermuscular injection of Heisler's

Mixture, a combination of chalmoogra oil, camphor oil, and resorcin. At present the skin condition is stationary and the parasthesia is somewhat improved. Under treatment with atropine, yellow oxide, dionin, and regulation of diet patient's vision improved from $\frac{20}{200}$ to $\frac{20}{40}$.

Doctor S. A. Agatston presented a patient with **tuberculosis choroiditis.**

Patient H. G., aged 55 years, came to the clinic at Bellevue Hospital with the complaint that ten days ago he noticed a sudden loss of vision in his right eye. Two months ago, he was brought to the psychopathic ward in a state of delirium and stupor. He remained in a stuporous state for three days. After that his mental condition was normal. His case was considered one of psychosis caused by arteriosclerosis. His blood pressure was 110—69. His heart was normal. His lungs, however, showed an extensive tuberculous process on both sides, and the patient has lost 25 pounds in weight during the past 8 months. His vision is: O. D. $\frac{20}{200}$, O. S. $\frac{20}{100}$. Ophthalmoscopic findings: O. D. vitreous opacities; a gray area in the region of the macula, 3 disks in diameter, raised about 1 *mm* above the level of the retina. The border of the area was diffuse, light-colored retinal blood vessels passing over the area. O. S. vitreous opacities, and two similar areas in the lower portion of the fundus.

The Wassermann test was negative; the patient has very bad teeth.

Doctor C. E. McDannald presented a patient with **keratectasia.**

Discussion: Doctor Claiborne asked if Dr. McDannald had examined the case with Placido's disk. A moment's use of Placido's disk would reveal whether this case was one of keratectasia or simply keratoglobus. He stated he found Placido's disk of great value in finding astigmatism and used it frequently in place of the ophthalmometer. A strong lens held behind the disk would give a corneal image so that the astigmatism or its absence could be detected at once. When there is no astigmatism the image of the disk on the cornea is circular, when there is, it is elliptical. In astigmatism with the rule, the long axis of the ellipse lies along the horizontal, against the rule lies vertical; in oblique astigmatism it is oblique. He found it possible not only to diagnose the astigmatism but to come within ½ to 1 D. of the amount and the axis within 5 to 10 degrees. Dr. Claiborne desired to recall the value of this method of examination, which had fallen into disuse, to those young men who had never used it and also to the older men who had used it and laid it aside. He had used it during the recent war in examining men for malingering. It was a great time saver.

Doctor George Vandegrift believes this to be a congenital anomaly as the woman has had the condition since birth. He thinks it is a reversion to the animal type of cornea for it is similar to the corneæ of fish.

Doctor Arnold Knapp said that he believed this to be a case of marginal corneal degeneration and called Doctor McDannald's attention to the scarred periphery of the cornea.

The paper of the evening was read by Doctor Alfred Wiener and Doctor Ellis Bonime on **sympathetic ophthalmia**—report of a case successfully treated. Doctor A. Wiener discussed the surgical treatment and Doctor Bonime, immunotherapy. (Complete paper appears in this issue.)

Discussion: Doctor E. S. Thomson said that this had evidently been a severe type of the disease and shows that surgical intervention is disastrous unless the inflammatory process is controlled before operation. The result certainly seemed a very good one.

Doctor Colman W. Cutler said: This is an extremely interesting and valuable contribution. The gravity of the condition, the apparently hopeless prognosis was obvious. There were probably foci of infection in the uveal tract which may in the long course of time have become attenuated, but by the repeated recurrences the eyes had become so sensitive that without the most thorough reinforcement of resistance or immunization and perhaps sterilization (for that is a fair statement), no further operative steps would have been feasible. The picture was that of a proliferative uveitis. The trend of opinion as to the etiology of sympathetic ophthalmia is toward an infection by an undiscovered organism. The cytotoxin theory and that of uveal anaphylaxis are still held, and the anaphylaxis of uveal pigment possibly influenced by a protein poison of bacillus prodigiosus is supported by Dr. Alan Wood's recent interesting work which seems the most valuable yet done in this field. It is not possible to summarize the work here, but it deserves very careful consideration. In any case the normal resistance of the eye may be so lowered that streptococci or staphylococci from neighboring or distant foci may lodge in the uveal tissues and the familiar picture of uveitis ensue, complicating the original plastic or proliferative uveitis of sympathetic origin. This might account for the success of the immunizing treatment in this case and justify its application in similar cases. Such complications probably offer a more hopeful field for vaccine or serum treatment than a disease due to a protein poison apart from the actual bacteria if such exists. In a case under observation, the right eye developed uveitis twenty years ago, became blind and glaucomatous and was enucleated in 1915 because of pain, after an iridectomy had failed to give relief. The remaining eye became affected probably before the iridectomy and for five years a chronic iridocyclitis has existed in spite of every effort to find and eliminate a focus. The eye has apparently been benefited—I may say saved, so far—by streptococcus vaccine given by Dr. John Richards. Syphilis and gonococcus infection were proven absent, but recently a noticeable improvement has followed treatment of the deep urethra by Dr. Lowsley and the use of a streptococcus vaccine from that region. I shall hope to report the case in detail later; it shows the necessity of persistence in the search for a hidden focus. In this case the teeth, tonsils, accessory sinuses, have been literally eliminated, and the possible source of his trouble is a prostate that gave no sign of disease until vigorously explored and treated. It is of vital importance in this case, as in Dr. Wiener's, to put the eye at rest, as a cataract is developing and the question of operation on an eye with uveitis must be faced.

Few chronic inflammations are simple; the lowered vitality of the tissues and the probable mixed infection should encourage the use of any measures not harmful, and such a case as this of Dr. Wiener's may well induce an optimism not hitherto felt.

Dr. Knapp doubted the diagnosis of sympathetic ophthalmia in this case because he thought it very unusual for the second eye to become affected when the first eye, instead of showing an aggravation of its symptoms, was steadily improving. He wanted to ask whether in the last operation the iris had been attacked, because it is a matter of experience that these eyes will stand an operation on the capsule but not one on the iris. He also would like to ask whether the injection of foreign proteid was regularly followed by any change in the symptoms of the eyes.

Doctor Ben Witt Key said that he had confidence in the effect of foreign protein whether bacterial (pneumococci or diphtheria) or other protein, injected to combat ocular infection, for his experience with the injection of anti-diphtheritic serum in severe ocular infection showed definite results almost every few days at the New York Eye and Ear Infirmary. However, he hesitated to accept the case reported as one of sympathetic ophthalmia, especially when mindful of a case in the hospital now with recurrent attacks of plastic iridocyclitis, having improved from $\frac{20}{200}$ to $\frac{20}{20}$ vision during four distinct periods of time after injections of tuberculin, and though the process followed upon an injury and removal of the fellow eye and clinically appeared to be one of sympathetic ophthalmia.

Doctor A. E. Davis asked why Doctor Bonime used typhoid vaccine in preferrence to other proteins.

Doctor Wiener in closing said that he thought this to be a true case of sympathetic ophthalmia and replying to Doctor Knapp said that while previous to the immuno-therapy, the slightest interference with the iris brought on an attack of iridocyclitis, after the above treatment no reaction occurred. In reply to the question whether the injection of protein brought on any irritation, Doctor Wiener stated that first all the symptoms of the existing low grade iridocyclitis were intensified, but gradually disappeared as the treatment was carried out.

Doctor Bonime in closing said that he used typhoid vaccines because the dosage was so easily regulated and there is no danger in the use of a foreign serum like diphtheria antitoxin. He used the pneumococcus and streptococcus in connection with the typhoid, his aim being to obtain results. For the future he suggests that the cases be treated in series, some with streptococcus, some with pneumococcus, and some with typhoid alone, in order to determine which was the effective vaccine, or whether, after all, the combination was necessary to bring about the results.

VOL. L. NO. 2.

ARCHIVES OF OPHTHALMOLOGY.

THE OCULAR MANIFESTATIONS OF EPIDEMIC ENCEPHALITIS.[1]

BY DR. WARD A. HOLDEN, NEW YORK.

WHAT is desired of me, I assume, is a comparative statistical account of the various eye symptoms found in epidemic encephalitis. In the extensive literature of encephalitis the eye symptoms noted in the various groups of cases differ considerably, according to the different observers. This difference, it may be, depends upon the mental condition of the patients and upon the observer's training in the examination of the eye and his facilities for examining the patient with the ophthalmologist's armamentarium, as well as upon the variations due to the personal equation.

Every ophthalmologist who has studied these patients in his examining room has noted relatively more cases of paresis of accommodation than are usually noted in the hospital groups, and he has doubtless diagnosed existing pareses of motor muscles of the eyeball more accurately. On the other hand, since these motor pareses are often evanescent and may have disappeared before the time of his examination, he may note fewer pareses, but obtain oftener a history of previous diplopia.

It has seemed to me that I could best serve your purpose by tabulating the eye symptoms from the case histories in institutions where great numbers of these patients have been carefully studied, and then commenting on the statistics so obtained and on others already published and also on my own observations and some verbally reported to me by colleagues. Dr. B. Sachs and his associates in the Neurological Service of the Mount Sinai Hospital, where more encephalitis patients have been treated than in any other hospital in New York City, most kindly invited me to go over their case histories of the last two years, and with the assistance of Dr. Morris Grossman, I have collated the eye symptoms noted by them in a hundred consecutive, unselected cases. An analysis of twenty cases at the Neurological Institute showed very similar percentages. Hence in order to keep the figures equivalent to the percentages I shall speak of the Mount Sinai cases only, since they are sufficiently numerous to be representative.

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[1] Read before the Association for Research in Nervous and Mental Diseases, New York, December 29, 1920.

The eye symptoms noted in one hundred consecutive case histories of epidemic encephalitis at the Mount Sinai Hospital are as follows:

A. OPTICUS SYMPTOMS.—Blurring of the optic disks in 4, papillœdema in 1.

B. OCULOMOTORIUS AND ABDUCENS SYMPTOMS.

1. *Ptosis.*—Of both eyes in 45, of one eye alone in 11,—in 56 patients in all.

2. *Extrinsic muscles of the eyeball.*

Paresis or paralysis of both external recti in 17,
of the right external rectus alone in 14,
of the left external rectus alone in 13,—in 44 patients in all.

Paresis or paralysis of both superior recti in 1, of both internal recti in 4, of the right internal rectus alone in 1.

Paresis of both internal and both external recti in 2.

Paralysis of all muscles supplied by one 3d nerve in 1.

Paralysis of conjugate dextroversion of both eyes in 2.

In all, weakness of the ocular motor muscles that would give rise to diplopia in 55 patients.

Nystagmus in 32 patients.

3. *Pupils.*—Irregularity in 15, inequality in 20. Sluggishness or absence of light reflex in 35 patients, in 13 of whom the convergence or accommodation reflex was sluggish also.

The irregularity and inequality of the pupils in 28 of the 35 cases were in eyes with sluggish pupils, so that irregularity and inequality not associated with sluggishness were noted but 7 times.

4. *Accommodation.*—Weakness of accommodation in both eyes in 1.

C. Facialis Symptoms.—Weakness of some or all of the muscles supplied by the facialis of both sides in 24, of one side in 49—in 73 patients in all.

COMMENT.

The most marked divergence I have found from these percentages is in the carefully studied 8 cases of Barker, Cross, and Irwin (*Amer. Journ. Med. Sciences*, cliv., 2–3). They found partial ptosis in 3, sluggish pupils in the entire 8, and weakness of accommodation in 4. Their reports on the recti muscles are less specific.

The percentages in the thirty histories reported in Tilney and Howe's book *Epidemic Encephalitis* are similar to the Mount Sinai Hospital percentages except as regards the recti muscles. Tilney and Howe found the *internal* rectus paretic much more frequently than the *external.*

Opticus Symptoms.—There was noted in four patients at the Mount Sinai Hospital a blurring of the optic disks and in one a definite papillœdema.

The earlier reports on encephalitis referred in many cases to blurring of the disks. But we recognize that a slight œdema and a reddening of the disks due to dilatation of the capillaries, with overfilled and perhaps tortuous retinal veins, is a fairly common condition when the general circulation is sluggish. In such cases a subsequent examination is made and if the condition remains unchanged we do not regard it as a beginning papillœdema and we are strengthened in this belief when the patient complains not of headache and vomiting, but merely of cold feet. It is possible that some of the cases of blurred optic disks reported may have had but little significance.

True papillœdema was noted in one Mount Sinai Hospital patient and was found in one of the twenty at the Neurological Institute. The latter patient, a child three years of age, had meningeal symptoms, paresis of both external recti, paresis of the right facialis and right hemiparesis, with papillœdema of two and a half dioptries elevation in each eye. She made a complete recovery. In another case with papillœdema, verbally related to me, there was found at the autopsy an extensive subcortical hemorrhage in the parietal region which had caused hemiplegia.

True papillœdema then is a very rare symptom of encephalitis and seems to occur only where there are unusual complications. This papillœdema is doubtless the result of increased intracranial pressure in most cases, although in some cases it may be due directly to meningitis.[1]

OCULOMOTORIUS AND ABDUCENS SYMPTOMS.—Inflammatory changes have been found widespread in the brain, but with great frequency in the brain stem, consisting of œdema, hemorrhage, proliferation of neuroglia, circumvascular exudation of leucocyte-like cells, and degeneration of ganglion cells. The meninges also are frequently inflamed. From this it is evident that there may be pressure upon the nuclei of the ocular nerves, upon the supranuclear and infranuclear fibers—direct and association—and upon the trunks of the nerves at the base of the brain. This pressure may be transitory or permanent, slight or destructive, or even alternating and recurrent. It is obvious that clinically one must find in this disease all degrees of muscular palsy and all possible combinations and varieties of palsy of the third and sixth nerves, with changes from week to week.

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[1] C. P. Symonds in a paper on "Optic Neuritis in Encephalitis Lethargica," *Lancet*, Dec. 18, 1920, after describing four cases studied at the Johns Hopkins Hospital, gives as one of his conclusions the following statement: "In the association of optic neuritis with acute disseminated myelitis we have an instance of involvement of the optic nerves in a diffuse inflammatory process affecting the nervous system, which is analogous to the association of optic neuritis with encephalitis lethargica."

In these ARCHIVES, vol. xl., No. 6, and vol. xliii., No. 3, I described five cases of optic-nerve affection in acute disseminated myelitis. In this disease the affection of the optic nerve is a localized inflammation about certain blood vessels in the nerve. There is, as a rule, no elevation of the disk and there ensues a partial or general pallor of the disk, with marked disturbance of vision. In three of the four cases in which visual tests could be carried out I found a lateral hemianopic defect in the field of one eye only, which seemed to me characteristic of the disease, and in one case an excessive concentric contraction of the field of one eye.

The reports of optic-nerve disturbances in epidemic encephalitis lethargica with which I am familiar, including those of Symonds, show little in common with the optic-nerve disturbances I have seen in acute disseminated myelitis. Therefore, until anatomical proof to the contrary is presented, I prefer to regard the optic-nerve disturbances of epidemic encephalitis as being chiefly of the papillœdematous type due to increased intracranial pressure, rather than of the retrobulbar inflammatory type, as Symonds would seem to suggest.

In general, in this disease, we find a disinclination to use the eye muscles or a quick fatigue and return to the position of rest after using them, even when there is no well marked paresis. In this, as in many disturbed mental conditions, the patient may dislike to look up and may simulate paralysis of upward movement unless repeated tests are made.

Ptosis.—In the lethargic state the patient may lie with his eyes closed in the position of rest and often cannot be urged to keep them open, or even to open them wide for a moment. This may be due to a mental disinclination, to photophobia, to a dread of diplopia, or to a spasm of the orbicularis palpebrarum muscles, as well as to weakness of the levators. When he can be urged to open his eyes a difference in the width of the palpebral apertures may be seen or a drooping of one or both upper lids may be noted, but except in the unusual cases of complete third nerve paralysis, complete ptosis is not likely to be present. In other cases the eyes are kept open, but winking is infrequent. Forcible closing of the eyes often leads to a marked tremor of the lids, for tremor is a very constant symptom of encephalitis. When one eye has been kept closed a few days to prevent diplopia its palpebral aperture will be narrower than that of the other eye when both are opened One can easily realize that the question of ptosis in a given case may admit of a variety of answers. Ptosis was noted in fifty-six of the Mount Sinai Hospital patients.

Extrinsic Muscles of the Eyeball.—Certain brain affections have rather definite paralyses of the ocular muscles which are pathognomonic. Thus after diphtheria there may be paralysis of accommodation on both sides without pupillary disturbances; in botulism there may be ophthalmoplegia interna on both sides—that is, iridoplegia and dilatation of the pupil with paralysis of accommodation; in polioencephalitis superior the two internal recti are first paralyzed and later often one or both external recti; in destruction of one abducens nucleus there is conjugate paralysis of dextro- or sinistro-version of the two eyes; in red nucleus involvement there is loss of upward movement of the eye; and with exudation at the base of the brain both sixth nerves or both third nerves in some or all of their branches may be affected.

In epidemic encephalitis almost all of these paralyses are found. And if there is anything at all characteristic it is the *frequent association of ptosis with paralysis of the external recti.* In the Mount Sinai Hospital group there were twenty-three patients in whom paralysis of one or both external recti (without accompanying paralysis of internal recti) was associated with ptosis of one side or both. This is a combination of third and sixth nerve affections that is rarely met with in any other disease.

The fourth nerve doubtless is affected at times in encephalitis, although paresis of the superior oblique muscle has not been noted in any reports that I recall. This may be because a paresis of the superior oblique might easily be overlooked in a lethargic patient, and even in a mentally alert patient it might escape notice when masked by more obvious palsies of other motor muscles.

There is a curious condition, of whose pathology we are ignorant, known as paralysis of divergence. In this condition there is neither paralysis nor spasm of the recti muscles and the mobility of each eye is normal, but the eyes are converged on a point some 15*cm* away and see single at this distance, while at greater distances there is homonymous diplopia in every direction of the gaze. The ætiology of this condition is obscure and the lesion is supposed to lie in a purely hypothetical divergence center. I have seen it in midbrain tumor and in uræmia. This paralysis of divergence was one of the earliest symptoms in a patient with encephalitis whom I saw privately, and two colleagues have told me that they had found the same condition in encephalitis patients, so probably it is not very rare if carefully sought for; and study of the cases in which it is present may lead to our better understanding of the condition.[1]

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[1] In some cases, paralysis of divergence has either preceded or followed paralysis of one external rectus, suggesting that the site of the lesion in this condition lies near the abducens nucleus.

It would be natural to assume that there is a break in the association tract between the abducens nucleus of one eye and the nucleus for the internal rectus of the other eye. However, we believe that the impulse which turns both eyes to the right arises from the right abducens nucleus. And if

The course of these palsies is not uniform; often they disappear in a few days, sometimes they are permanent, sometimes they are recurrent. In general we may say that diplopia disappears early, ptosis later, and pupillary anomalies and weakness of accommodation last of all the eye symptoms, many months after the onset.

Nystagmus.—There may be the slight nystagmus of asthenic states or the pronounced nystagmus of organic brain disease. Very frequently too there are the nystagmoid twitchings in the direction of action of a muscle that is paretic. One variety of irritative spasm that has been described to me is a lightning-like oscillation of the two eyes, without parallelism of action, coming on at intervals when the eyes are in the position of rest. These different varieties have not been differentiated in our figures, but nystagmus was noted in 32 of the Mount Sinai patients.

Pupils.—In 35 of the 100 patients there was defective light reaction of the pupils, often with irregularity and inequality. As a rule in encephalitis the sluggish pupils are small or of medium size. They differ from the pupils of cerebral lues only in the greater frequency of an accompanying defective convergence reaction. The characteristic pupils of cerebral lues are seen also at times with tumors and non-luetic inflammations in the brain stem. In encephalitis this symptom is very common. Barker finding it in every one of his reported cases.

This is not the place to discuss the mechanism and manner of production of the Argyll-Robertson pupil, but it is hoped that study by neuropathologists of these brains with inflammatory changes still fresh may solve some of the unsettled problems.

In lues, if there is a paresis of accommodation there is also dilatation of the pupil and iridoplegia—an ophthalmoplegia

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this impulse were sent from the abducens nucleus in normal measure to the right external rectus and incompletely to the left internal rectus the result would be divergence of the two eyes and not the convergence which is found in these cases. Could we assume that the impulse which turns the eyes to the right arises from the nucleus of the left internal rectus, an interruption of the association fibers in the longitudinal fascicle would prevent the full impulse from reaching the right external rectus and thus lead to convergence of the eyes. But since this assumption seems untenable, our attempts to solve the problem with our present data are purely speculative and vain.

interna. A peculiarity of encephalitis pupils is that in many cases there is a paresis or even complete paralysis of accommodation without dilatation of the pupil—in other words there is a normal pupil or an undilated Argyll-Robertson pupil plus the paresis of accommodation that formerly we saw as an isolated symptom in diphtheria alone. This paresis of accommodation in encephalitis, furthermore, is usually bilateral, whereas in lues it is mostly found in one eye only.

The characteristic features of the sluggish pupil found in encephalitis then are, first, the great *frequency of accompanying defective convergence reaction*, and second, *the association often with paresis of accommodation without dilatation of the pupil.*

Accommodation.—Accommodation may be apparently normal by the tests, yet the patient may not be able to maintain it for a length of time, that is, there is quick fatigue of accommodation, or there may be various degrees of actual loss of accommodation. When there is actual loss of accommodation the hyperopic patient, who is accustomed to overcome his hyperopia by exercising his accommodation, finds that his distant vision has suffered as well as his near vision. And the emmetropic patient finds that he can read print only with great effort and by holding it at arm's length. This paresis of accommodation may easily be overlooked in the bed patient, but the ophthalmologist finds it frequently in the convalescent.

FACIALIS SYMPTOMS.—The facial palsy is for the most part slight and often limited to the lower branches. It is rarely sufficiently pronounced to give rise to lagophthalmos or even to cause difficulty in closing the eyelids.

In conclusion I might say that since the eye disturbances of encephalitis are sometimes of early onset and then the most annoying of the patient's symptoms, the ophthalmologist may be the first physician to be consulted and in times of epidemic he may from the eye symptoms alone, if lues can be excluded, make the diagnosis.

ON BACKING OUT OF CATARACT OPERATIONS[1]

By Dr. H. GIFFORD, Omaha, Neb.

THIS paper is offered as an attempt to indicate the best way out of a bad hole. The hole referred to is the position in which an operator finds himself when, on completing the incision for a cataract expression, the vitreous begins to escape before the lens is expelled. In this position he knows that to attempt to expel the lens by pressure means failure with almost certain loss of the eye. On the other hand, if he extract the lens with hook or loop a good deal of vitreous is almost certain to be lost, and while in many such cases the result is fair the average result is, to say the least, poor. The writer has been gradually reaching the conclusion that unless, to prepare for this contingency, he has previously dissected up a large conjunctival flap and inserted stitches with which this flap can be quickly brought down to reduce the escape of vitreous to a minimum, the only justifiable procedure is to back out, that is, to interrupt the operation, desist from any attempt to remove the lens, allow the incision to heal, and to deal with the cataract later on by some safer method. The writer confesses that at the bottom of his conclusion is a holy horror of extensive loss of vitreous. This is not founded on any especially bad record in this respect. In the course of 35 years' practice I have never lost but two eyes directly from loss of vitreous, and I have fished out many a lens with fair or even excellent results. But in contrasting the results of cases in which considerable vitreous has been lost, with those of other cataract operations, I feel positive that if I were the patient, in such a hole, I should insist, if the choice were offered me, on trying the interrupted operation; and where the patient has only one eye, I consider it to be the operator's imperative duty, when confronted with this dilemma, to stop the operation. You may ask: If it is right to do this where the patient only has one eye, why is it not right to adopt the same plan when he has two eyes? To this I can only answer: Why not?

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[1] Read before the American Academy of Ophthalmology and Oto-Laryngology, Kansas City, October 14, 1920.

As to the means which should be adopted to get rid of the lens after the first operation has been interrupted, three courses are open. One is to neglect the cataract until the second eye has been operated on; leaving it to the patient whether, after this, another attempt should be made with the first eye. The second is to get rid of the lens by repeated discissions. The third is to prepare for loss of vitreous by dissecting up a large flap, as indicated above, and to complete the removal of the lens by extraction with a loop or hook after the ordinary incision. The writer has tried all three of these plans with greater or less success.

CASE 1.—E. L., aged 48, lost all sight in the left eye fifteen or twenty years before, through some form of vascular degeneration. The right eye on November 22, 1912, had a cataract two thirds ripe and progressing very slowly; V = $\frac{5}{200}$, projection good. On November 23, 1912, preliminary capsulotomy made; and as this produced very little result, another capsulotomy was made on December 4, 1912. On December 28, 1912, an ordinary cataract incision was made in the limbus and a small iridectomy was done. On completing the iridectomy, the anterior chamber, instead of remaining empty, filled with fluid vitreous, which escaped in a slow, steady stream from the incision. Confronted with the alternative of removing the lens with a hook or loop, with the probability that this would cause so much loss of vitreous as to seriously endanger the patient's only eye, or of backing out, I decided that if I were in the position of the patient, I should want the surgeon to back out and to do it quickly. So I interrupted the operation, and without disturbing the lens, allowed the incision to close. After a lapse of three months I started again in the attempt to get rid of the lens by repeated discissions. I did the first of these on March 26, 1913, the second on May 16, 1913, and on the day following the nucleus was found in the anterior chamber showing a nearly clear pupil above. On June 24, 1913, vision with correcting glass was $\frac{20}{50}$. The nucleus was allowed to remain in the anterior chamber, gradually getting smaller; and finally after a year and a half, it disappeared entirely.

During this time his vision varied from $\frac{20}{50}$ to $\frac{20}{70}$ and at times he would have quite sharp attacks of pain with some congestion. These finally ceased, however, and his vision remained at about the same level until January, 1917, when a detachment of the retina developed and the sight was gradually lost.

Not an especially brilliant result, but in view of the tendency to degeneration which both eyes showed, I am quite certain that the man obtained five years of useful sight which he would not have had if I had completed the removal of the lens at the first operation.

CASE 2.—G. T., aged 34; had lost right eye as the result of a cataract operation done when he was a child. The left eye had been under my observation since 1907. At that time it had myopia of 18 D. with numerous vitreous opacities and some atrophy at the center of the retina and V. with correction $\frac{20}{50}$. On October 7, 1913, he came to me with a somewhat shrunken hard-looking cataract in the left eye. This looked so tough that I decided erroneously that discissions would probably help it very slowly if at all; so I started to do a combined expression; but on completing the iridectomy, fluid vitreous escaped at such a rate that I made no attempt to express the lens but allowed the wound to close and, after repeated discissions, I obtained by September 13, 1915, a clear pupil with the nucleus lying at the bottom of the anterior chamber as in Case 1. It gradually disappeared without causing any disturbance. Vision with correction, $\frac{20}{200}$, which he has retained to the present time.

CASE 3.—(Record mislaid.) J. S., aged about 67. Right eye lost many years before. Left eye complete cataract following blow from a chip of wood some months before. Pupil somewhat irregular from slight iridodialysis. Iris not wobbly, projection fair. Started to do a combined expression. On completing the iridectomy vitreous appeared in the wound, operation interrupted; wound allowed to close without disturbing the lens. Treatment of cataract by repeated discissions begun after about two months. The cataract was absorbed very slowly, but at the end of a year the pupil was clear enough to allow a good view of the fundus, when it was found that the nerve was atrophic. The sight was only fingers at two feet. A poor result which would have been good if the nerve had held out.

Besides these one-eyed cases, in which the necessity for backing out of the operation, in order to increase the patient's chance, was rather obvious, I have, for the same reason, backed out of cataract operations with eight two-eyed patients. In two of these the *second* eye was successfully operated on in the ordinary way and nothing further was done to the first eye. In four cases, at the second operation, preparation to limit loss of vitreous by a sliding flap was made; and the lens was removed either by expression or by extraction. The immediate result, in all these cases, was good; the astonishing thing about them being that in two of the cases which had shown prompt and indubitable loss of vitreous at the first operation, there was not the slightest sign of vitreous loss at the second operation; the lens being expressed in the ordinary way without difficulty. In one of these patients the sight of the eye was subsequently lost by detachment of the retina; but this can hardly be charged against the method adopted, since if the detachment were in any way due to the removal of the lens, it would have certainly been much more apt to occur if the lens had been extracted, with the inevitable greater loss of vitreous, at the first operation. In the seventh case, the lens was cleared up by repeated discissions, with vision $\frac{20}{30}$. In the eighth patient the method of frequent discissions is being carried out with such slow progress toward absorption that I am beginning to doubt whether it will not be best to remove the lens with the sliding flap preparation.

Besides these cases in which the reason for interrupting the operation was actual loss of vitreous, I have beaten a retreat in some other cases; either because the incorrigibility or the stupidity of the patient made it evident, in the early steps of the operation, that the danger of loss of vitreous would be decidedly greater than the average and ought to be met with special preparation; or because of some accident or oversight in the ordinary preparatory measures. As an example of the latter contingency, I may cite a case in which with the patient on the table, a nurse handed me a hypo half filled with pure carbolic acid instead of the cocaine solution which I wanted. I put three drops of this in quick succession on the center of the cornea before discovering the mistake. Luckily plenty of alcohol was right at hand and after using it very freely, no harm resulted; still I thought best to call this a "preparatory operation," and to postpone the expression of the lens for a few weeks, when it was done with a perfect result.

In another case the patient behaved so badly that after doing the puncture and counterpuncture, I decided that to finish the operation without losing half the vitreous would require a special dispensation; so I desisted without completing the incision and have had no opportunity to do anything more for the patient. If he returns I shall have to do his operation under ether.

The necessity for backing out on account of the behavior of the patient can be largely done away with if the practice is followed of always making the patient come to the table with an empty stomach. If he then reveals himself as an obstructionist or a hopeless squeezer, all that is necessary is to give him a general anæsthetic and do the operation in peace and quiet. I don't pretend to follow this rule, but I am convinced that it is a mighty good one; and after any of you have done an expression under a general anæsthetic with fixation by the tendon of the superior rectus, I venture to predict that you will begin to wonder whether it wouldn't be a good thing to do all your expressions in this way. Of course I do not wish to even suggest that this should actually be done in all cases, but there is no doubt in my mind that there is a wider field for general anæsthesia in cataract operations than is generally accepted.

Another way to help avoid the necessity of backing out would be to make more general use of repeated discissions as the primary method in place of expression. It is now evident that in at least two of my cases this would have given a good result with no more delay than is frequently necessary in children. But the difficulty of judging which cases are suitable for this procedure will necessarily limit its use.

Another plan to avoid many of the occasions for backing out, is to do all peripheral expressions with a sliding flap. It is a very good plan to follow. Some years ago,[1] I reported a series of about 130 expressions done in this way without a single loss and with good results in all but two cases, in both of which the visual result was due to anteoperative complications. I never had a better series, and my only reason for discontinuing it as a routine practice was that it took about twice as long as the ordinary operation. But even if one does not adopt the sliding flap as a routine measure, there can be no doubt that when the condition of the eye or the disposition of the patient leads us to expect an unusual amount of trouble, the sliding flap should be used.

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[1] *Annals of Ophthalmology*, January, 1916.

As to the psychology, both of the patient and of the operator, in such cases, a word may be worth while. Starting with the self-evident proposition that under no possible contingency should the interests of the operator outweigh those of the patient, we must admit that human nature will not let us crowd our own interests entirely out of sight. We would never think of deliberately sacrificing any advantage for the patient to save our own pride, peace of mind, or our purse; but when it comes to deciding, on the spur of the moment, to disappoint the patient and his friends and perhaps have him go off and get a successful result at the hands of someone else, for a purely hypothetical advantage, the decision may not be so easy. Personally, I have never had occasion to regret backing out of one of these cases. In all but one, the patient, when the condition has been explained, has gladly accepted the situation and has felt grateful for the extra solicitude shown for his welfare.

The disposition and experience of the operator will naturally play a large part in forming the decision as to whether any of the emergencies mentioned above demand an interruption of the operation; but in any given case the operator can hardly go wrong if he adopt the plan which he would want followed if he were on the table instead of at its head.

ON METHODS OF DEALING WITH THE CAPSULE IN CATARACT EXTRACTION.[1]

By Dr. ARNOLD KNAPP, New York.

THE one step in the operation for senile cataract on which there is still the most divergence of opinion is the manner of dealing with the capsule. I have therefore selected this phase of the subject for my topic in the discussion of this evening. The method of treating the capsule depends, in my opinion, on two factors, the patient and the kind of cataract. This can be expressed in another way as follows: The three procedures, the cystotome, the toothed capsule forceps, and the blunt capsule forceps, are proportionate steps, both in ease of execution and in success of obtaining a clear pupil according to the behavior of the patient and to the kind of cataract.

I am assuming that an iridectomy is always performed in the operation for senile cataract. The cystotome is the easiest instrument to handle of these three procedures; it is the instrument of choice for less experienced hands and the instrument of necessity in badly behaving patients. There are many ways of lacerating the capsule with this instrument. The guiding principles are ease of delivering the nucleus and cortex, the avoidance of dense cicatricial bands which make the subsequent discission difficult and the avoidance of capsular tags healing to the corneal wound, with subsequent glaucoma. These conditions can be best met by the peripheric linear incision of which my father was a firm advocate. The addition of a vertical incision as suggested by v. Graefe allows freer access of aqueous to retained cortex and gives less tendency to a closed bag of capsule, though the opening does not always stay open as it theoretically should and the resulting thickened vertical band of capsule is difficult to divide except with a scissors at the so-called secondary or needling operation. Multiple lacerations are bad, as they lead to inclusion of capsule in the corneal wound and irregular thickened bands in the after-cataract.

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[1] Read by invitation before the New England Ophthalmological Society, Boston, December 22, 1920.

The toothed capsule forceps is a more difficult instrument to handle. With its sharp teeth it cuts its way through the capsule, often without tearing away enough to leave a good opening; it is difficult to tell how large an opening has been effected and it is the custom of some operators to add the cystotome maneuver. In this procedure it is also important to avoid inclusion of capsule in the corneal scar and it is important to stroke back capsular tags in completing the toilet of the cataract eye. Secondary glaucoma also results from the torn margin of the anterior capsule becoming adherent to the posterior, thus shutting off cortical remnants, which subsequently swell and by pressing forward the root of the iris, obliterate the iris angle and cause secondary glaucoma. This occurs some weeks after the extraction, particularly in operations on immature cataracts with some cyclitic reaction. A case in point is that of F., aged 53, who was operated on for immature cataract on June 29, 1920. The blunt capsule forceps was used, the capsule tore, the cataract was successfully removed with vision of $\frac{20}{30}$, clear pupil, some cortex up and out. On July 28th, one month later, patient developed glaucoma. Neither the iris pillars nor the capsule were caught in the corneal section, but while the iris below was flat it was bulging over both pillars, more on the temporal than the nasal side. An iridectomy was done up and out, which included the temporal iris pillar, the retained cortex was stroked away; the margin of the other pillar was found glued to capsule and was freed with the spatula. Recovery was uneventful, with cure of glaucoma and ultimate vision of $\frac{20}{20}$.

The third procedure is that with the blunt forceps, which I use in all cases if the patient's behavior is good. This forceps is the one devised by Kalt in Paris, which consists in a bifurcated cup-shaped extremity without teeth. Its application requires a certain amount of practice and the more the tip of the forceps engages in the capsule, the easier it takes hold, and on the other hand, the more likely is the rupture of the capsule. The advantage of these forceps is that a firm grip is possible with less danger of cutting the capsule; it is thus possible to dislocate the lens, or failing in this, to rupture the capsule at its periphery and not directly at site of contact. In this way a large piece of capsule can be removed, which often includes the entire anterior capsule. The point of application is at the lower pupillary margin, or even beneath the pupillary margin, opening up the branches as wide as possible; the larger the knuckle of capsule grasped the less likely does it tear and the more likely is the lens subluxated. The grip must not be too tight and no sudden movement or twist made. In this maneuver the lens in its capsule is freed from its lower attachment in a certain proportion of cases, depending on the kind of cataract and the state of the capsule, provided the patient's eye remains quiet. It is a matter of experience that the more hypermature the cataract, the easier is the dislocation. It is not likely to occur in patients under 50. The amber, sclerosed lenses which are often nuclear and immature dislocate easily; the smooth capsule, especially with "asbestos sheen" cortex, does not. On the other hand, the Morgagnian cataract with fluid cortex is very difficult to grasp unless the blades of the forceps are opened wide enough to grasp the lateral margins. After the cataract is dislocated, which is recognized by the lower margin appearing in the pupil, the forceps are released and extraction in the capsule proceeds according to the Smith technique.

In some cases, though the capsule is firmly gripped, it is too elastic to give away; in these cases it is not wise to persist and it is better to let go and adopt one of the other methods, or, after first making a vertical lateral cystotomy the capsule is seized with the blunt forceps.

It is not necessary to rehearse the desirability of removing a cataract in its capsule; our aim at the present day is to attain this in whatever way it can be accomplished with the greatest safety. I have been following the above described method for ten years and am about to give a detailed report on the second consecutive hundred extractions in the capsule. I shall not go into a consideration of these results now, but wish to present the subject from the viewpoint of the relative frequency of the various procedures, based on a study of my last three hundred consecutive cataract operations.

				Vitreous
Total number of consecutive extractions	300			
Blunt forceps	214			
Capsule ruptured		125		
Extraction in capsule		89		8
Capsule ruptured during delivery			3	
Unable to grasp			7	
Unable to dislocate though grasp was firm			4	
Toothed forceps	51			1
Cystotome	35			

This shows that extraction in the capsule was effected by this method in 42%; this number is too small because among the cases in which the capsule was ruptured in applying the blunt forceps, in some, a rupture was purposely attempted and a dislocation was not desired, though this, I find, was not always stated in the hospital records. A rupture of the capsule occurs particularly when the point of the forceps is applied, a small piece of capsule only is seized and a quick, twisting movement made. The percentage of cases of rupture of capsule during delivery was less than 3%. The percentage of vitreous loss was 9%. In the cases where it is not possible to grasp the capsule (seven in number), the blunt forceps slipped without taking hold on one or two attempts and the method was abandoned. In four the grasp was firm but the suspensory ligament seemed unduly elastic and traction was not persevered in for fear of causing a cyclitic reaction, as it is not known how much traction the ciliary processes will bear.

This method of extraction in the capsule has been taken up by others and has been modified both in the blunt capsule forceps and in its application. The chief modification is the one suggested by Török at our hospital, which consists in the following: After gripping the lens capsule with the blunt forceps, pressure is applied to the eyeball below the cornea and the cataract is drawn out with the capsule forceps in situ. As this method is being practiced by a number of the members of this society I have gone over Dr. Török's cases in the hospital records with his permission during this same interval of time, with the following results: The percentage of successful dislocations was 59%; the number of ruptures of the capsule during the process of delivery was 12%. Rupture of the capsule during delivery is an unpleasant complication, as it requires the removal of the separate capsular bag, which is often difficult, especially in the presence of vitreous escape. The percentage of vitreous loss was 13%; it is my impression that the amount lost is also greater in the latter series, moreover the vitreous escape occurs at an earlier period in the extraction, while in my series the vitreous loss occurred at the end of the extraction and did not materially depreciate the ultimate vision or the healing of the wound.

While I personally prefer the process of tumbling, as it is the safer method, according to Colonel Smith's vast experience, the Török method succeeds in dislocating a larger percentage of cataracts. A study of these results suggests a combination of these two methods. This would consist in grasping the lens capsule at its lowest part, moderate traction is then exercised in different directions with simultaneous external pressure with the Smith hook at the inferior margin of the cornea until dislocation below has taken place, release of the forceps and of pressure, then proceed to extract the partly subluxated lens by external pressure, causing the cataract to tumble and to be delivered feet first, according to the Smith technique.

OBSERVATION, MANAGEMENT, AND TREATMENT OF THE CATARACT PATIENT BEFORE AND AFTER OPERATION.[1]

By Dr. WALTER H. SNYDER, Toledo.

THE care of cataract should start, if possible, months before the actual cutting is done.

It is very necessary to get a careful history, not only of the immediate ancestry but the collateral branches. When this is done it will be found that many in the same family history will report cataracts, and it is becoming a matter of common knowledge that these diseases of the lens seem to run in certain families. This part of the history is not necessary for the good of the patient but that we may have some exact knowledge of the condition under which it arises.

The personal history should be carefully taken letting the patients drift along giving their expression with as few suggestions as possible and then rearranging them in chronological order for the permanent written history. I think it is a necessity that a Wassermann should always be made. At present we are also having blood chemical analyses made on all these cases but cannot report its value at this time. The aged often retain products in the blood far in excess of normal and it is possible that it may be very detrimental in eye surgery as we know it is in general surgery. A history of stormy eye-sight in childhood, following measles, will frequently be found and there seems to be a disturbed visual function during the entire life of many of those who are to wind up with the condition that we call cataract. Especially should glasses be neutralized that they have used, and we should inquire how satisfactory they were, how frequently changes were necessary, what attacks of inflammation they have had, when they first noticed the failing of vision, how rapidly it progressed, what form it took, what intercurrent diseases occurred at the time, and it is surprising how elaborate a history can be gotten out along the exact lines which can now be well defined.

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[1] Read before the Eye, Ear, Nose, and Throat Section of the Ohio State Medical Association, at Toledo, June 1, 1920.

The most important single thing to observe of the personal examination is the condition of the pupil, and its reaction to light. This, of course, tests the entire visual arc and is one which is of the greatest importance in patients who speak a language we do not understand. The quick prompt acting iris leads one to know the condition of the fundus almost as well as any test could tell us, but where it is possible we should make finer and more delicate tests of light perception and projection. By this I mean using a small light 5 or 10*mm* in diameter in a dark room and standing at a distance of five to ten feet and having the patients point towards the light, shifting a few inches at a time, up and down, right and left. This would give you an excellent idea of the presence of macular scotomas which sometimes have been found to render the post-operative vision almost useless after a beautifully executed operation. The patient who cannot perceive nor project accurately the position of the light, must be warned that the operation will not result in as good vision as he desires, although worth while. This all has to do more with the prognosis of the operation than its successful completion.

The next thing we examine is the condition of the cornea for fine scars or opacities, all of which may be hardly noticed by a patient with an already partially cataractous lens but which when we come to fit glasses for normal vision will cause a serious reduction in the vision.

The next thing is to examine the lacrimal apparatus and drainage of the eye. This usually is patent enough for surgical purposes but one should determine this as positively as can be done by fluorescin or argyrol, staining the handkerchief or by flushing the eye after dilating the puncta which in cases which need conjunctival treatment should always be done. The rapidity with which a conjunctival infection clears up after dilating the puncta is very noticeable over the ordinary treatment. When we first see a cataract case we dilate these puncta, treating them with a weak solution of silver (one grain to the ounce), and then have them use hot applications followed by flushing with a boric solution.

The whiter the eye and less congestion in the lids, the better the result that may be expected from the surgical side. The tension is taken and the scleral toughness of age is not confused with the increased tension of chronic simple glaucoma. I am not a believer in operating on new cataract cases the day they are first seen or even a few days after. Most of them would be benefited by a course of treatment which includes a reasonable study of their excretions and hygienic habits.

While the presence of sugar in the urine does not contradict the operation, it is well for the surgeon to know it and I have no hesitation in operating on cases which have shown four and five per cent. of sugar but I wish to choose my time for the operation. The use of glycerin in the eye to relieve the congestion has been useful and in many cases clears up the anterior congestion very quickly.

We will suppose now that the patients have been properly instructed in the care of the eye and we have decided to do the operation at a certain date. My habit is to have my patients in the hospital a day or two before the operation and if they wish the operation done without their knowledge, we require usually a week for this. During this time the night nurse observes their sleeping qualities, coughing, restlessness, what sort of a bed they are most comfortable in, and their general reaction to the environment of a hospital. It is my custom to operate in a special bed in the room or ward of the patient and they are trained in this, either by my nursing assistant or myself, to do the ordinary things demanded during the operation. A sign is displayed on the door to ensure quiet. The strong psychological feature of their training is that it will not pain them, that they will not be injured in any way, and that they can successfully do all that is required of them. If they are to be operated on without their knowledge, there is a long line of treatment adopted which I shall not speak of here but ordinarily, especially if the preliminary iridectomy is adopted, they are given a day or two to become acquainted in the hospital, and then the operation is performed in bed. The face is thoroughly scrubbed, the hair and eye brows trimmed and in women the hair braided in a queue centering on top of the head. The face washing in some patients is done on entrance and repeated.

I usually order a drop of atropin, solution 1 per cent. one hour before the morphine.

It is our custom to give them an average dose of morphine about an hour before the operation. We have tried many of the drugs used for this and have finally decided on morphine and atropine as the best combination for our purpose.

During all the time that patients are in the hospital, the hot applications are kept up and occasionally the conjunctiva is touched up with silver solution and they are not put to bed until a few minutes before the time for their morphine.

I cannot impress too strongly upon my audience the necessity of completely winning the confidence of the patient. Unless this is done by a certain amount of familiarity with the doctor and his methods, they will resist or attempt to rely upon their own resources which is apt to mean a squeeze or shrinking from the technique and probable loss of vitreous. We do not tell the patients they are being trained for the operation when we ask them to open the eyes, to look upward or look downward, to close them gently, to keep them closed, to allow us to put the speculum in and flush the eye without holding their breath, but this is the effect which it has upon them and those who have used this method will conclude with me that the successful outcome of many surgically unfit cases is excuse enough for all the trouble we have, even though they are charity cases.

During the war the difficulty of getting instruments sharpened lead me to experiment with the sterilization in boiling oil and this was so satisfactory that I have continued this practice. Any neutral light hydrocarbon oil can be employed all of which have a higher boiling point than water and the one we are using boils at 260° F. and we put in an indicator such as is used in sterilization by steam to determine when a minimum satisfactory temperature is reached. I have been astonished to note that there seem to be grades of infection and that the eyes that have been operated on by these instruments seem less reddened by the operation and subsequent bandaging than by instruments sterilized by alcohol or boiling water. The instruments are drained on gauze and passed through ether after being taken out of the oil and the edges seem almost unaffected by repeated use.

At present we are using after the operation a brown petroleum which is mixed with a light hydrocarbon oil so that it is just spreadable. This is put on the lids and in the corners of the eyes and over this a double butterfly cut of gauze also moistened with a lighter hydrocarbon, carefully smoothed out and adjusted to the face. Over this a double butterfly of cotton moistened to conform to the shape of the brows and cotton pads fastened with water adhesive plaster.

A little item we have found useful is to cut these strips long enough so that one quarter inch of each end can be turned upon its ends thus offering a finger hold in removing them when moistened. It has been so advantageous that we are doing it in all the cases now. In children, foreigners, or those who are apt to be unruly, we are putting on a figure of eight of light gauze and over this a Ring mask. On the Ring mask is a white cross made of adhesive plaster to indicate which eye has been operated upon. This is for the benefit of the floor supervisor or the night nurse who can tell by the slightest glance in the darkened room whether the patient is encroaching upon his operated eye in turning.

My choice is to operate in the afternoon thus insuring the patient a good first night. If the operation is done in the morning it is my experience that the patients do not have as good a first night. They sleep during the afternoon and are wide awake at night but if done at two or three o'clock in the afternoon, there is an hour or so to recover from the slight excitement and a little smarting and after a light supper they are content to settle down and the effect of the morphine has given them a long, easy dreamless sleep and they awake refreshed the next morning. This is my reason for operating in the afternoon.

If patients are unruly or complain of their back aching, we see no objection to their being half-raised in bed or reclined on one side or the other but it is important, however, not to start this turning unless it becomes absolutely necessary, for if a patient begins by being tired on first one side, then the other, they will want to be turned every half hour; while if they ignore the first few calls of fatigue, they soon become accustomed to it and fall asleep and lie quietly the rest of the night. Children will do better usually with a double starch bandage as this allows them to be taken up and held but as a rule we only bandage one eye on a child as they are terrified when they awake and cannot see. In all these cases the lids should be splinted with one or two strips of water adhesive plaster put in such a way to prevent opening the upper lid.

It is very important that the bed be comfortable and I have three or four special beds and mattresses of a better grade than those ordinarily used for the comfort of my operative eye cases.

The first dressing is at the end of twenty-four hours, the bandage is removed but the eyes are not opened unless I note an odema of the upper lid in the inner angle of the eye. The eye having been thoroughly put under the influence of atropine at the time of operation, I do not worry about a possible iritis; I use atropine very sparingly. The first dressing is made at the end of twenty-four hours for the comfort of the patient and it is replaced without opening the lids at all.

We are very particular in using a flushing solution that is not too warm or too cold and we are using Sharp and Dohme salt tablets No. 2. One of these in eight ounces of water gives a bland unirritating solution which can be readily made and is much more satisfactory than the attempts of the nurse to make it from a brine which she uses for ordinary dilutions. I flush the eye thoroughly and it is very refreshing to have this warmed water pouring over the closed eye. This is done to both eyes and the bandage and complete dressing is replaced.

At the end of forty-eight hours the eyes are opened but nothing but the physiological salt solution is used unless there is some very special indication.

One should constantly keep in mind that comfort means rest and rest means prompt healing. The lashes should be straightened out at each dressing. A little round pledget of cotton dampened and pressed flat should be used to wipe the edges of the lids and the adjustment of the dressing on the eye should leave the patient refreshed. Mental confusion following operations can be very largely obviated by the following procedures: Arrange for someone in the family to call regularly and talk with them; even twice daily is not too often with bad cases; then too I have found ward cases do not have this trouble as much as private-room cases, and I prefer rooms with two beds in them, having noted how well these cases pass the time away by chatting and this occupation is really the cure for the condition. The greatest complaint we have from these cases is the loneliness and this is done away splendidly by the two-bed ward.

To induce sleep for the second and third nights I use ten grains each of sodium bromide and chloral hydrate, and this can be repeated if necessary.

Watch especially for deaf patients and those who speak English indifferently.

The first symptom of lack of orientation has come on in the evening or night and the night supervisor should have special instructions to watch for and report the slightest vagueness of location. By having them sit up early in bed and the third day in a chair and the early use of unoperated eye if it has some vision, many of these cases go through without the slightest difficulty, even those who have a history of previous trouble.

When it is well marked give them all the vision possible and have a daughter stay most of the time. If the eye will permit it send them home; this is the great cure, but if this is not possible have a near relative sit and talk with them for hours and I have been very successful in winning them back. The cause of this is evidently the quiet, the lack of talking about familiar things, and the enforced blindness through bandaging. In dressing them encourage talk about their home and family, and the nurses should frequently drop in for a chat with them.

The second day, if there is no objection, the patient can sit up in bed and it is my custom to allow a little greater latitude each day.

The third day the eye is flushed freely with the warm physiological salt solution and the patient allowed to sit up in a chair. Most of my cases go through with no additional atropine except that instilled at the time of operation.

On the fourth day we give them the unoperated on eye. The lids will become sodden and there will be epithelial débris which it will take a little time to dislodge and clean. Usually the fourth day we use dry dressing, not even petroleum is used to moisten the gauze.

About the sixth or seventh day we allow one-half hour to an hour exposure of the eye to the air before the bandage is replaced and on the seventh day a still greater latitude is allowed and the eye is usually then white. The lashes are not matted down. There is no spastic entropion and the eye is at least three weeks farther in convalescence than is found by the old promiscuous use of atropine and sodden wet dressings day after day.

On the seventh or eighth day we make use of an eye shade. It protects the patient from the bright light, allows the eye to become gradually accustomed to use and does away with the bandage which is always a source of irritation. It also protects the eye from unauthorized handling and contact with surrounding objects.

I prefer not to have the patient leave the hospital until after two weeks. By that time the average patient has learned automatically to protect the eye and in three or four weeks the preliminary examination can be made for glasses.

METASTASIS OF CARCINOMA INTO AN ENDOTHELIOMA OF THE OPTIC SHEATH.[1]

By Dr. MARTIN COHEN and Dr. WARD J. MacNEAL.

(From the Department of Ophthalmology and Department of the Laboratories, New York Post-Graduate Medical School and Hospital.)

(*With eleven illustrations on Text-Plates II.–IX.*)

INTRODUCTION.

METASTATIC growth of one neoplasm within another is a well-established pathological phenomenon. Carcinomatous invasion of a dural endothelioma (arachnoid fibroblastoma) appears not to have been previously recorded and because of the relative infrequency of the latter tumor in the sheath of the optic nerve, the possible occurrence of such a combination would appear to be quite rare. This unique feature is associated with certain other clinical and pathological manifestations which give it a peculiar interest.

History of the Patient.—Mrs. J., æt. 45, housewife, was admitted on March 26, 1920, to the Harlem Hospital, service of Dr. Haubold, with his diagnosis of metastatic carcinoma of the brain. Her husband and six children are alive and healthy; no miscarriages. Patient stated that she had suffered for the previous three months from severe and constant pain all over her head, with nausea and recent failing vision in her only seeing eye, the right. The left eye had been practically blind for more than two and a half years, the exact duration being uncertain. Vision of the right eye had been good until very recently. Patient remembered that poor vision in left eye had existed at least for eighteen months before her left breast was removed. She complained of constant coughing, with blood-stained expectoration, constipation, poor sleep, and poor appetite. Menstruation was normal and had not ceased. Previous illnesses were of no significance except an operation for alveolar carcinoma of the left breast, performed by Dr. Russell Fowler at the Wyckoff Heights Hospital, Brooklyn, sixteen months before (*i.e.*, December, 1918).

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[1] This paper was presented before the Ophthalmological Section, New York Academy of Medicine, October 18, 1920, and before the New York Pathological Society, December 8, 1920.

Physical Examination.—The patient was a poorly nourished, mentally dull, partially disoriented woman. Left angle of mouth drooped; teeth were in poor condition. On left side of chest, extending into axilla, was an old scar of a Halstead operation. There was dullness over the base of the left lung, with distant bronchial breathing and voice sounds; occasional rales at the right base. Examination of heart and of abdomen were negative. The left upper extremity showed a marked atrophy and inability to functionate. The knee jerks were diminished on the left; normal on the right. Ankle clonus and Babinski's sign were not obtained. Palpable lymph glands were not enlarged. The urine was normal. Systolic blood pressure was 120; diastolic, 78. Temperature was 101; pulse 92; respiration 24; blood Wassermann negative. Examination of the head by Roentgen rays was unsatisfactory because of the incessant coughing.

The spinal fluid was under marked pressure and showed 20 cells per *cu. mm.*; Noguchi reaction was positive; Fehling test positive; smear for tubercle bacilli negative; Wassermann test negative.

The ophthalmological examination showed no exophthalmos, displacement of eyeball, or motor anomaly. Palpation for retroörbital growth was negative; tension was normal. Pupils were regular, central, and but moderately dilated. The direct pupillary reaction of the left eye was slight while in the right eye it was more pronounced but even here subnormal. The consensual reaction of both eyes was sluggish. Vision in the left eye was light perception only; in the right eye, motion of fingers at one meter. Light projection was normal in both eyes, but not prompt. No scotomata were elicited.

The fundus of the right eye showed a lesion confined to the disk and its immediate vicinity. This was reddish in color and elevated to 5 diopters; its margin completely obliterated by marked œdema, numerous spindle-shaped hemorrhages and whitish exudates. The veins were considerably engorged and tortuous and the arteries contracted. In the left eye there was a distinct pallor of the temporal side of the disk; otherwise the appearance was normal. Fundus diagnosis was papillœdema in right eye, due to a metastatic carcinoma of the brain; retrobulbar neuritis of left eye, probably due to general carcinomatosis.

There are three interesting points in the clinical features, which require discussion:

(1) The practical loss of vision in the left eye, of long duration, associated with only moderate dilatation of the pupil, sluggish response to light, slight temporal pallor of the disk, and absence of vascular changes in the retina.

(2) The temporal pallor of the left disk.

(3) The unilateral papillœdema of the right disk.

These will be considered in the light of information subsequently obtained.

The patient's condition became more serious from day to day and after eight days in the hospital, she died.

Necropsy.—Examination was restricted to the cranium. Reflection of the scalp revealed a number of small whitish nodules over the right parietal bone, varying in size from 3 to 12*mm.* They were somewhat adherent to the scalp and some of them intimately adherent to the cranium. Upon removal of the skull cap both cerebral hemispheres showed flattening. Meninges appeared normal. Upon lifting the brain a whitish tumor was revealed at the base. The left optic nerve was elongated, running through the substance of the tumor and intimately adherent to it. The optic chiasm was depressed and pushed to the right. The right optic nerve was distorted and elongated. The tumor was attached to the left optic nerve between the chiasm and the optic foramen. Upon dissection the growth was intimately adherent and appeared to involve the sphenoid bone at the junction of the left wing and body. The pituitary body was compressed but not invaded by the growth. Cut surface of the tumor appeared white and homogeneous. Upon sectioning the brain, several separate tumor nodules were found in its substance, one in the right hemisphere, just anterior to the fissure of Rolando, near the cortical surface. This measures 12*mm* in diameter. A similar nodule in the temporal lobe measures 6*mm* in diameter and a third of similar size was found deep in the white substance of the posterior lobe of the same hemisphere.

Laboratory Study.—Several pieces of the cerebrum and a portion of the base of the skull, including both optic foramina and the intracanalicular portions of the optic nerves, were sent to the laboratory. Photographs taken during the course of the autopsy were also furnished.

One of these photographs shows a rounded tumor situated at the intracranial opening of the left optic foramen (Fig. 1). A drawing of the base of the skull (Fig. 2) shows more clearly the appearance of this tumor and its relation to the left optic nerve at its entrance into the cranial cavity. The pieces of cerebral tissue showed several separate round, infiltrated spots in the cerebral substance, widely scattered, evidently metastatic new growths.

The tissue was fixed in formalin. A small portion, approximately 2*mm* in length, was cut from the intracranial end and from the orbital end of each optic nerve. These pieces were mordanted in Mueller's fluid, embedded in celloidin, and stained by the Weigert-Pal method and by iron hæmatoxylin and Van Gieson's stain. The bone of the skull was fractured and carefully separated from the intracanalicular portions of the optic nerves and from the rounded tumor. The tumor was nowhere adherent to the bone. The former was, however, intimately adherent to the dura and to the left optic nerve. The intracanalicular portions of the optic nerves were embedded in paraffin and sectioned longitudinally. The left nerve was considerably distorted in its passage through the tumor. The sections of the intracanalicular portions were stained with hæmatoxylin and eosin and also with iron hæmatoxylin and Van Gieson's stain. The large rounded tumor was divided and several pieces were sectioned in paraffin, stained with hæmatoxylin and eosin and with iron hæmatoxylin and Van Gieson's stain. Pieces of the brain containing the metastatic tumors were treated in the same way.

Microscopic Examination.—Sections of the cerebral metastases show infiltrating new growth consisting of rather large cells, somewhat irregular in form, with relatively large, vesicular nuclei and rich in mitotic division figures (Fig. 3). In places the tumor cells are closely packed in solid masses, especially around the numerous large blood vessels, but in other places they are arranged in narrow solid columns and even in tubules. Areas of necrosis are present. These metastatic tumors were regarded as metastases from the carcinoma of the breast, which had been removed about a year previously. Sections of the original breast tumor have been obtained from the Wyckoff Heights Hospital and, although somewhat faded, they show essentially the same type of tumor growth as is now seen in the cerebral metastases (Fig. 4). After consideration of other possibilities we still regard these cerebral tumors as carcinomata metastatic from the breast tumor.

Sections of the rounded tumor at the left optic foramen show a mixed character. In general it consists of irregular whorls of densely packed elongated or spindle cells separated by somewhat looser connective tissue with moderate vascularity (Fig. 5). Small hyaline bodies with concentric markings and deposits of lime salts are present in very small numbers. At one place the lumen of a large vein contains a mass of the new growth projecting from the wall into the lumen (Fig. 6). These general features characterize the tumor as a dural endothelioma, perhaps the most common tumor found in the intervaginal space.

This new growth was readily separated from the neighboring structures with the exception of the left optic nerve and its sheath. This nerve is surrounded by the tumor at the inner termination of the optic foramen and considerably distorted. Approximately longitudinal sections of the nerve show the intracanalicular portion of the intervaginal space occupied by the endothelioma, which does not pierce the pial sheath but appears continuous with the inner layer of the dural sheath and the outer layer of the pial sheath of the nerve in this region (Fig. 7). The endothelioma has therefore taken origin from the layer of cells (endothelium?) lining the intervaginal space in the intracanalicular portion of the optic sheath; it has compressed the nerve in this region and has extended backward in the intervaginal space to the cranial cavity, where, relatively free from bony confinement, it has enlarged to the irregularly rounded mass shown in Figure 2.

Concerning the finer structure and classification of the cell type from which this tumor has been derived, the recent paper of Mallory should be taken into account. This authority would place all these tumors formerly designated as dural endotheliomata into a new class designated as arachnoid fibroblastoma. Mallory does not question the origin of the tumor from the layer of cells lining the intervaginal space, a layer which has long been called endothelium, but he does question this fundamental histological term and would regard this so-called endothelial layer as merely a differentiated connective tissue. The conception is supported by the demonstration of collagenous and elastic fibrils in the tumors.

It is of course evident that endothelium is closely related to connective tissue, and it may be a moot point just where the lymph channels are to be called clefts between connective tissue elements and where the lymph channels lined by endothelium may be said to begin. There can be no doubt, however, that the subarachnoid space, which is a potential cavity of wide extent, is actually lined by cells differentiated from the ordinary connective tissue cell. It would seem as reasonable to assume that endothelial cells, derived from mesenchyme, may also retain the property of producing connective tissue fibrils under the conditions of tumor formation. However, because these tumors derived from the lining of the subarachnoid space and of the intervaginal space constitute a fairly definite group, it may be well to use a distinct name for them. Whether the name arachnoid fibroblastoma (fibroma) is really better than the name endothelioma may be left undecided for the present. According to Byers this tumor is the most common intradural tumor of the optic nerve.

An interesting feature of this case is the presence of groups of cells of a quite different type within the endothelioma. Such a small group is shown in Figure 5, and in Figure 8 a large part of the picture is occupied by these cells. It is only in the inferior and mesial portion of the tumor that these cell groups are found. They correspond in all respects to the type of cell in the cerebral metastases and in the original mammary tumor (Fig. 4) and many of their cells are in process of mitosis (Fig. 9). It is therefore evident that we have here a metastatic carcinoma of more recent development invading the basal portion of a dural endothelioma of longer standing. In most places one has little or no hesitation in deciding to which tumor any group of cells may belong, but there are some areas in which a possible transition is suggested. We are, however, inclined to discredit the evidence of such transition and cling to the earlier explanation.

Sections of the pituitary body show very small nodules of metastatic carcinoma present in this structure also; but nothing suggesting an extension of the endothelioma into this organ.

Pathological alterations have not been demonstrated in the sections of the right optic nerve. The left optic nerve, on the other hand, was markedly distorted and compressed near its entrance into the cranial cavity and the intervaginal space filled up with new growth in the inner half of the intracanalicular portion. Next to the nerve, this new growth is endothelioma with only small scattered nests of carcinoma and it does not pierce the pial sheath. Farther away, however, there are abundant nests of carcinoma and these invade the dura in the vicinity. The cross section at the intracranial end, stained by the Weigert-Pal method, shows extensive degeneration of the nerve (Fig. 10). This has probably been brought about by the pressure upon the nerve within the optic foramen. The cross section at the orbital end (Fig. 11) shows the myelin fairly well preserved for the most part but there is a somewhat indefinitely outlined, crescentic light patch of degeneration in the temporal half of the nerve, which evidently corresponds to the situation of the more delicate papillomacular bundle of fibers.

The anatomical points of interest which require discussion may be enumerated as follows: (1) Multiple metastatic carcinoma in the cerebral substance and in the pituitary body; (2) large dural endothelioma (arachnoid fibroblastoma) arising in the intervaginal space in the intracanalicular portion of the left optic sheath, compressing and distorting the nerve, and extending backward and expanding into a large rounded mass in the intracranial subarachnoid space; its pedicle and inferior portion being infiltrated also by metastatic carcinoma; (3) extensive degeneration of the intracranial portion of the left optic nerve associated with rather limited degeneration confined to the papillomacular region of the posterior orbital segment of the same nerve.

Discussion.—The almost complete loss of vision in the left eye, which began several years before, may be explained as due to pressure upon the intracanalicular portion of the optic nerve, exerted by the slow-growing dural endothelioma. This same pressure accounts for the degeneration of centripetal fibers in the intracranial portion of the left optic nerve and also offers an explanation for the absence of œdema of the nerve head in the left eye, for it has blocked the transmission to the orbital portion of the left intervaginal space of the augmented intracranial pressure during the last weeks of the patient's life. The retinal circulation in this eye remained undisturbed as the tumor was located entirely posterior to the entrance of the central artery and vein.

The temporal pallor of the left optic disk, seen during life, is to be considered in conjunction with the rather distinctly limited degeneration of the papillomacular bundle. Evidently there has occurred here a relative selection of these particular neurones for destruction, such as is observed in certain general intoxications. Three possible explanations for this degeneration may be offered: (1) The pressure upon the nerve may have initiated a centrifugal degeneration of these fibers proceeding toward their ganglion cells in the retina from the point of pressure, the other fibers of the optic nerve having escaped because of their less delicate and less highly specialized character. (2) The papillomacular bundle may have degenerated because of a general intoxication to which these structures have been more susceptible than the remaining optic fibers. (3) This papillomacular degeneration may have resulted from a relatively localized light choroiditis or degeneration of the retinal ganglion cells of the macular area induced by excessive stimulation, because the visual structures of the left eye have been denied their normal reflex protection against excessive stimulation through the interruption of the centripetal limb of the reflex arc. Such injurious stimulation might be expected to destroy first the most highly specialized visual elements. Of these three suggested explanations none can be said to be securely established by the available evidence and logical objections may be raised to each in turn.

The unilateral papillœdema in the right eye is obviously to be regarded as the ordinary phenomenon seen in brain tumor, due to heightened intracranial pressure forcing an excessive quantity of fluid to seek its exit along the intervaginal space of the optic sheath, dilating this space back of the sclera and exerting pressure upon the optic nerve and the retinal vessels. In the left eye this phenomenon was lacking because the endothelioma blocked the intervaginal space from the excessive intracranial pressure.

The dural endothelioma (arachnoid fibroblastoma) is to be regarded as a growth of several months, possibly several years duration. It shows the typical structure of this variety of tumor, whorl formation, hyaline and partly calcified concentrically marked spherical bodies, and in one place a large cellular bud projecting into a vein. This last feature indicates the close relation to the normal arachnoidal villi and is essentially similar to that shown in Figure 11 of Mallory's paper. The rapidly proliferating cell nests within this tumor are considered to be of the same nature as the similar cell nests found in the pituitary body and in the multiple tumor nodules in the cerebrum, and all these are regarded as metastases from the carcinoma of the left breast, removed sixteen months previously.

Summary.—In this case there has been a dural endothelioma of long duration extending from the sheath of the left optic nerve into the cranial cavity. Subsequently, multiple metastases from a carcinoma of the breast have developed within this earlier tumor, in the pituitary body, and in various parts of the substance of the brain. The unusual ophthalmological manifestations are explained in a large measure by the simultaneous occurrence of these two neoplasms. There is presented here an instance, unique so far as we are aware, of the invasion of a dural endothelioma by metastatic carcinoma.

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OCULAR MANIFESTATIONS OF DISEASE OF THE PARA-NASAL SINUSES.[1]

By Dr. JAMES BORDLEY, Jr., Baltimore, Md.

(*With four illustrations in the text.*)

IN view of the voluminous literature which is classified under my title, I feel that I must offer some reason for again calling attention to the subject. While I will probably say nothing that has not been said many times before, I find my justification for this communication in the interest which is frequently excited by a recitation of personal experiences. In truth what I write has in the main come to me through clinical and laboratory studies and I only offer it as confirmatory evidence of what has been pointed out before.

The presence of diseases of the para-nasal sinuses is sometimes extremely easy to determine, at others it presents problems which are only solved by careful, thoughtful, and I can almost say prayerful study. To pass a final opinion as the result of one negative investigation is only inviting disaster for the patient and mortification for the physician. Indeed, I have come to look upon the diagnosis of sinus disease in many instances as an achievement. To depend solely upon intranasal inspection is folly—more frequently one would be misled than helped. There are but three reliable indications of sinus disease to be elicited by such an investigation: pus, polypi, and necrotic bone and they are more frequently visually absent than present.

In doubtful cases, we can call to our aid transillumination—which is helpful only in the anterior cells—or suction—which will make manifest pus when the ostium of the sinus lies below the level of the pus. It is, however, upon the radiograph that we must largely depend. While this last offers exceptional advantages a single negative finding should not be considered as definite evidence of the non-existence of sinus disease. Its value is dependent not alone upon the clarity of the picture but upon the experience of the one who translates that picture. Only the other day, I saw a child with choked disks on whom had been performed a radical antrum operation in consequence of the radiographer mistaking an occipital ridge for pus in the antrum. The child really had choked disks the result of a cerebellar tumor.

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[1] Read before the College of Physicians, Philadelphia, Pa., November 18, 1920.

To read a picture, it is essential to know the plane in which it was taken and the shadows which necessarily result from bony obstructions. It is also necessary to have a clear mental picture of the anatomical variations in size and position of the sinuses. Of course radiographs are valuable not only in detecting pus but in determining bony deficiencies and disease of the mucus membrane. One distinguished radiographer told me that he would never give a final opinion on any sinus without first viewing it from six different positions. These difficulties which I have outlined are only too real—and are sufficient proof of the statement which I recorded above—that a negative finding of any single method of examination is not proof of the absence of sinus disease.

I hope it is clear that it is essential to a correct diagnosis that every available bit of evidence be brought to light and as the ocular manifesations of sinus disease are many and fairly common, a close association of rhinologist and ophthalmologist has sought the advice of the rhinologist in solving his ophthalmological problems but I fear the rhinologist has not always availed himself of the opportunity to utilize the services of the ophthalmologist. I earnestly plead for the sake of a clearer understanding that this natural affinity be fostered. For the general surgeon and the internist who are seeking light on obscure diseases dependent upon infectious foci, a union of forces, ophthalmological and rhinological, has frequently resulted in the discovery of important evidence.

As I propose to speak only of optic nerve disturbances, it is not necessary to analyze the extensive literature of the ocular manifestations of sinus disease which has accumulated in the last few years. There are certain symptoms, however, which occur with sufficient frequency as to render them of diagnostic value. The most important of these are, orbital neuralgia; fugitive œdema of the eyelids; congestion of the conjunctiva with the familiar "wet eye"; recurring attacks of episcleritis; and paralysis of one or more of the ocular muscles. None of these conditions are constant, none are peculiar to sinus disease, nevertheless their presence must be considered as at least suggestive.

DeSchweinitz says: "It is well known that sinusitis may be associated with ophthalmoscopic lesions, such as optic neuritis, retrobulbar neuritis, and thrombosis of the retinal vessels. It may manifest itself as an ordinary œdema of the nerve head or as an inflammatory optic neuritis. In a certain number the manifestation is that of a retrobulbar neuritis with its well known symptoms of obscuration of vision progressing to complete or almost complete blindness, with at first negative ophthalmoscopic findings." These ophthalmoscopic pictures are not of uncommon occurrence, and are when discovered of great diagnostic importance.

My experience leads me to believe that the most usual ophthalmoscopic picture is that of dimness or haziness of the margins of the disk. What this means in terms of pathology I do not pretend to know but that it is by no means pathognomonic of sinusitis is quite certain. Considered by itself, it is valueless, but taken in conjunction with other evidence, it is suggestive.

We find the picture of inflammatory neuritis, retrobulbar neuritis, and choked disk. Like haziness of the margins of the disk, these symptoms taken alone are only suggestive. In our series inflammatory neuritis was more frequently met with in early adult life and in association with moderately acute nasal symptoms; retrobulbar neuritis with its typical ophthalmoscopic picture occurred in chronic types of sinusitis; and I have come to regard choked disk as an indication of a possibly serious extension of the sinus disease. I have seen but four patients with choked disk, and in three post-mortems which followed very definite evidence of the disease to the meninges was present. I have no doubt a sort of benign choked disk can result from an increase in intracranial pressure brought about by non-purulent reactions in the cavernous sinus or the meninges just as transitory choking of the disk develops as the result of inflammatory disturbances of the mastoid and middle ear. As a rule, such nerve heads recover leaving behind little or no evidence of damage.

The ophthalmoscope is helpful in spite of its marked limitations but of even greater service is a study of the fields of vision. As the nerve is exposed to diseases of the sinuses from the tract to the eyeball, changes in the visual fields may assume practically any known form, some, however, as diagnostic evidence are of much greater value than others and in the foremost rank I would place enlargement of the blind spot of Mariotte.

As a result of clinical and experimental evidence, I am forced to disagree with the suggestion that enlargement of the blind spot is a constant symptom of disease of the para-nasal sinuses. In 102 patients with sinusitis enlargement of the blind spot was discovered but thirty-one times. It was found more often in disease of the posterior than the anterior sinuses—in the proportion of five to one, and it was never our fortune to find it associated with infection of the maxillary antrum. Theories concerned with its production are too numerous to consider. We can, however, briefly sum them up by saying that most authors agree that the primary injury is to that portion of the optic nerve—the canalicular—which lies in the optic canal. Swelling of the soft tissues in this rigid canal from any cause must result in a certain inhibition of the functions of the optic nerve. If the pressure is not intense, or is short lived, the result will be an enlarged blind spot as the most peripheral fibers are the peripapillary fibers of the retina; if the pressure is continued indefinitely the whole nerve will cease to function. We proved experimentally that enlargement of the blind spot will sometimes follow excessive tension within the sphenoid sinus. In eight patients with sphenoiditis but with normal blind spots tampons were placed with varying degrees of pressure in the sphenoid. The fields of these patients were systematically watched and in two definite evidence of disturbance in the nerve developed. In one of these patients (in whom the mucous lining of the sphenoid had been virtually destroyed by disease) within an hour had a hazy color zone surrounding the blind spot, this was followed within five hours by the formation of a positive enlargement of the blind spot surrounded by a relative color scotoma. Is it possible that our failure to alter the blind spot in six cases was dependent alone upon the thickness of the sinus wall?

To account for the alteration in the blind spot associated with disease of the anterior sinuses is not altogether an easy task. It seems probable, however, that the periosteum of the orbit becomes involved in the sinus disease and as the duro-periostial lining of the optic canal is virtually only a continuation, becomes swollen also, this causing pressure on the nerve. Schaeffer has told us of a frontal sinus which lies in close proximity to the optic nerve, and has pointed out as another possible factor certain vascular connections, these deserve the most serious clinical consideration.

While of less frequent occurrence than enlargement of the blind spot, other para-central and central scotomas are more interesting and from a visual standpoint more important. The intensity of central change varies from a mere disturbance in red and green perception to a positive scotoma for colors and white extending beyond the normal blind spot. While some authors have attempted to differentiate this scotoma from similar changes due to other causes I have found but two significant facts: in sinus disease the alteration is usually unilateral and more rapid and definite in its formation. There are, however, many exceptions to this rule.

We are still in doubt as to the direct causative factor in central blindness. Birch-Hirschfeld looks upon it as a result of toxæmia resulting from venous stasis within the optic canal; Hajek described it as a sign of perineuritis from pressure; and Gradle attributes it to disease extension through soft tissues and vessels from the infected sinuses. In the eleven cases that I have observed, it appeared only as a symptom of chronic sinusitis; in but four of these patients was it associated with enlargement of the blind spot.

Disturbances in color perception and peripheral contractions are so influenced by pain, fatigue, and alterations in illumination as to make them of little or no diagnostic value.

Many patients with sinus disease seek our advice for disturbances in visual acuity. It is a well recognized fact that in many of them there is a central or para-central scotoma; others have large extracentral scotomata which bother vision, and still others present no objective signs of disease. There is one other cause of visual disturbance which finds scant mention, failure of accommodative power. We found it proportionately more often than enlargement of the blind spot. Without a marked error of refraction exists, the disturbance in distant vision is not troublesome, but in close work it frequently is productive of much discomfort. I mention this symptom because I believe the resulting visual disturbance is usually laid to the door of the optic nerve. I saw a patient only a day or so ago whose sole symptoms were persistent basilar headaches and—as she expressed it—"a cross-eyed feeling.". She required a presbyopic correction of 1 D. in her left eye and 4 D. for her right. She proved to have a right sphenoidal sinusitis. We were also able experimentally to prove the accuracy of this observation. By injecting irritating substances within the spenoidal sinus a relaxation of accommodation was temporarily brought about and the near point carried further from the eye. In a patient with syphilitic invasion of the nose and para-nasal sinuses and extensive destruction of the mucous lining, we were unable to induce a change in accommodation. We assume this to be a reflex disturbance originating in the muco-periosteal lining of the sinuses.

To summarize, as a result of sinus disease we may have disturbance in the optic nerve varying from slightly blurred vision associated with no objective sign to profound atrophy. We will not wonder at this if we will but superficially examine the published anatomical studies of Onodi, Loeb, and Schaeffer. For nearly half and sometimes more of its length, the optic nerve lies in contact with the thin walls of either the posterior ethmoid or sphenoid sinuses and frequently with both. The danger to the nerve is enhanced by the fact that not only are its intracanalicular and intraorbital portions exposed to attack, but likewise the chiasm which lies on the superior wall of the sphenoid. Damage to the nerve apparently depends more upon the thickness of the sinus walls and its proximity to the cavity of the diseased sinus than upon the intensity or nature of the sinus disease.

Before showing some slides illustrative of clinical disease, may I be permitted to express the hope in dealing with such eye affections conservatism should be our watchword. And by conservatism I do not mean fear to follow a bold course when necessary. I would rather define it as action based upon striking evidence. If we are to judge by published statements, inoffensive sinuses are frequently obliterated before a careful diagnostic routine has eliminated other possible causes, in the hope such action will cure some obscure ocular disease. Unfortunately, we know no ocular manifestation peculiar to sinusitis, nor do the coincident presence of the two justify the assumption that the one is dependent upon the other. Optic nerve disease is not only a serious menace to sight, but it is only too frequently an early manifestation of serious constitutional disease. It behooves us therefore before attempting intranasal operative treatment to make sure that we have neglected no essential detail in diagnosis. Sinus operations are not free from danger either to eye or life—it is, therefore, incumbent upon us before undertaking such procedures to fortify ourselves in advance by submitting our evidence and the patient for the careful inspection of a competent internist or neurologist.

Case I.—The first case which I wish to present is that of a man of 36, who for about two years had been subject to severe basilar headaches. He consulted a confrère of mine for some visual disturbance in the fall of 1916. My connection with the case was that of consultant and it is by permission that I recite in brief the circumstances.

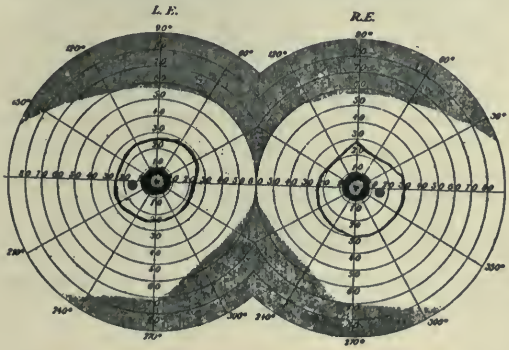

Illustration No. 1, Case I. Before operation.

Upon examination the patient was found to have bilateral para-central ring scotoma, marked peripheral contraction, central vision in each eye of $\frac{20}{100}$. The ophthalmoscopic appearances were quite normal. The right sphenoid occupied a large portion of the body of the sphenoid bone, the left sphenoid was rudimentary and both were the seat of disease. The superior posterior wall of the right sinus was found necrotic and fairly well covered with granulation tissue.

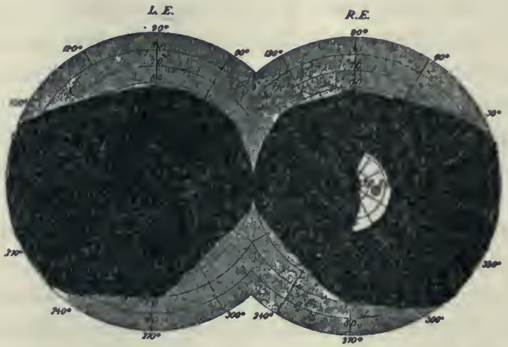

Illustration No. 2, Case I. After operation.

The patient was operated upon, the anterior wall of the sinus was broken down, and the granulation tissue was very carefully removed. Immediately following the operation the patient complained of inability to see across the room. No examination was made at the time. The next morning it was discovered that the patient was blind except for a small visual area in the right eye and the nerve heads were distinctly cloudy. Microscopic examination of the scraping from the sinus proved the mass to contain shreds of nerve fibers, obviously parts of the chiasm. The patient developed meningitis and some days later died. Post-mortem examination was refused. This case illustrates very graphically one of the serious consequences which may fall to the lot of the most skillful and experienced surgeon in operative procedures on the sphenoid sinus.

Case II.—In January, 1917, I was requested to examine the sinuses of a patient with spreading infectious arthritis whose right eye was said to have gradually become blind.

Upon inspection the right side of the nose was found to be the seat of extensive suppurative disease involving the ethmoidal labyrinth and the sphenoidal sinus; the left middle turbinate was markedly swollen and pus was discovered in the corresponding sphenoidal sinus.

The margins of the right optic disk were obscured, the retinal veins were rather full and slightly tortuous; in the field of vision there was a large absolute central scotoma involving the blind spot associated with marked peripheral contraction. The left fundus was normal; vision $\frac{20}{15}$; an enlargement of the blind spot with slight irregular peripheral contraction. The right ethmoidal labyrinth and sphenoidal sinus were subjected to operation and within twenty-four hours a marked convergent squint developed.

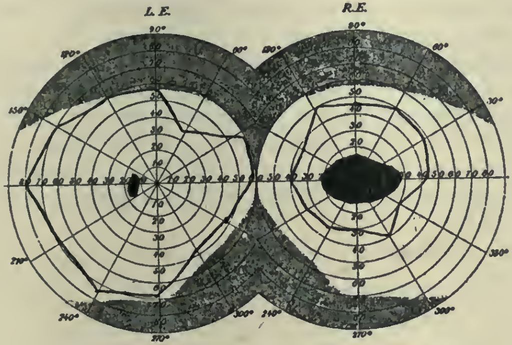

Illustration No. 3, Case II. Before operation.

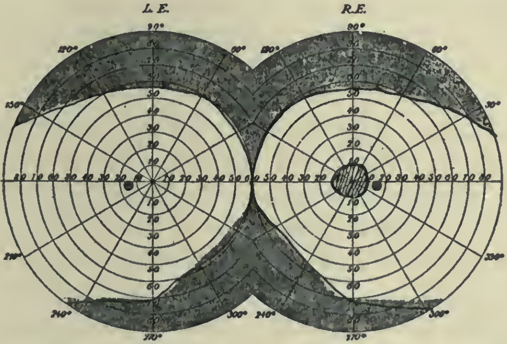

Illustration No. 4, Case II. Five months after operation.

As the patient's physical condition—the result of his invading arthritis—demanded action, the left sphenoidal sinus was operated upon the following week. In spite of the fact that no attempt to do more than enlarge the normal outlet of the sinus so as to insure drainage, a convergent squint developed in the eye on this, the left side. I have seen paralysis of the ocular muscle before as a sequel of sinus disease but never from operation. Since then I have seen one other case—in consultation—the result of catheterization of the sphenoidal sinus.

These cases evidently belong to that group described by Professor Schaeffer in which the abducens lies more or less exposed in the wall of the sphenoidal sinus. Fortunately, the double convergent squint made a rapid recovery and the fields of vision, taken some weeks later, were free from scotomata except for a small relative central scotoma on the right side.

TOTAL KERATOPLASTY.[1]

By Dr. J. W. BURKE, Washington, D. C.

THE question of successful transplantation of the cornea has been for many years the dream of ophthalmic surgeons. The first attempt was made by Riesinger in 1818, who attempted to transplant from one animal to another. Earlier than this Pollier de Quengsy (1787) had attempted to insert a piece of glass in the cornea. He was followed by Nussbaum and much later by Von Hippel, but these cases were uniformly unsuccessful, though Salzer was able to hold a small piece of celluloid in the cornea by small hooks for nearly three years.

About 1835 Bigger performed a number of transplants on animals, but his results were unsuccessful, owing to the difficulty experienced in keeping them still and the resultant infections.

From 1839 to 1843 Koenigshoefer, Muehlbauer, and Hauenstein experimented on animals, performing partial keratoplasties, in which Descemet's membrane was not removed. The results were fair as regards transparency.

In 1872 Power advocated the use of a cork borer in removing the cornea, and simultaneously Von Hippel's work gave the subject a tremendous impetus. Having given up the older methods of operation he led a number of contemporary investigators in the use of the trephine. This was considered a great advance, Von Hippel devising later a very ingenious trephine for the removal of the graft, and the preparation of the patient, and it stimulated such men as Fuch, Zirm, and Magetot. Each of these has done valuable experimental work,

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[1] Candidate's Thesis accepted by American Ophthalmological Society, 1920.

Magetot especially. He emphasizes the use of a large button of cornea, 5 to 6*mm* in diameter, using a modified Elliott's trephine for its removal. In a careful study of the subject he is convinced that corneal grafts can be kept for some days in Ringer Lock solution, having reported a case successfully so kept for eight days, with fair operative results.

Opposed to trephining, Morax, Stauch, and Wolf, and much later, Loehlein believed that it was necessary to establish the nutrition of the graft as quickly as possible, and each of these experimented with flaps including a portion of the conjunctiva, Loehlein devising a very ingenious operation, described in the ARCHIVES OF OPHTHALMOLOGY, 1912.

So far the subject has been approached from two standpoints (having first eliminated the question of foreign body inserts), the slow restoration of nutrition to the flap, and the rapid restoration of the same. Those who advocated the use of the trephine felt that the rapid restoration of nutrition was attended by greater vascularization and growth of fibroblasts in the graft, while adherents to the graft with conjunctival attachment felt it essential to restore the nutrition with the least possible delay.

In 1919 Bonnifon published the conclusion of his researches on the regeneration and transplantation of corneal tissue which present still another angle to the subject, his conclusions being as follows: The apparent integrity of the graft and especially the conservation of transparency are not a criterion of survival. The division of grafts into autoplastic, homoplastic, or heteroplastic has no absolute value, certain heteroplasties evolve clinically and histologically as the best autoplasties. The grafts which are assimilable act as a frame for tissue replacement, eventually all of the graft being replaced except the epithelium.

My own view of corneal transplants was gradually evolved from the fact that I believe primarily that it is necessary to establish the nutrition to the graft as quickly as possible, with as little disturbance as an operation of such magnitude permits. I eliminated heterogeneous grafts as hopeless from previous experiments, and autogenous as impracticable. (I have never seen a case where I thought one was justified in using normal cornea of an already damaged eye to attempt a graft, though I do not deny this may in extremely rare cases occur.)

I was stimulated to graft the entire cornea from work which Gehrung began in 1909, his idea being to dissect the conjunctiva from the cornea at the limbus, back a short distance, denude the cornea of its epithelium for *2mm* from its margin, put a purse string suture around the conjunctiva, draw it up over the denuded cornea and allow it to heal and reëstablish its circulation. Remove the center of the cornea from the animal to be grafted and after making a large circular flap in the donor remove the cornea with its new conjunctival attachment, making the transplant of the same diameter as the corneal opening of the host. This work was done on rabbits, but while under my observation no transplants were made, owing to all the rabbits becoming infected in their preparation.

The only attempt at total transplantation so far reported was one by Shimanowski, who made a corneo-ciliarplasty on a young male adult, reporting vision of fingers at the end of seven months, but one year later phthisi bulbi, following an attempted iridectomy.

The operation that I have devised after perfecting the technique on fresh cadavers and rabbits is as follows:

DESCRIPTION OF THE OPERATION.

After the usual aseptic preparation of the eye, under cocaine and adrenalin anæsthesia similar to that used in cataract operations, the conjunctiva is incised *3mm* from the limbus, making a complete circumference of the cornea. This is then dissected towards the cornea, keeping close to the sclera, the dissection being continued well on to the cornea until the semitransparent cornea can be seen, being careful not to buttonhole. In cases where the patient is unruly I would suggest the placing of four sutures through the insertion of each rectus. Fold the conjunctiva well back on the cornea towards its center. With a cataract knife perforate the cornea at the limbus, making an opening large enough to insert the blade of a curved Stevens scissors. With short snips remove the cornea completely with its conjunctival fringe. Difficulty in avoiding the iris may be found, but by using Stevens scissors whose points have not been too sharply ground I have found this comparatively easy to do. The transplant should have been prepared in the same way just prior to the removal of the cornea from the host, and kept in warm saline until ready for use. With the unimpaired iris, *i.e.*, the sphincter, intact, both in animals and human beings I found no tendency for the lens to escape, the iris holding it well in place. At this stage care is observed in keeping traction on the sutures, as well as to prevent the orbicularis from exercising pressure on the globe. Assuming that all corneas have practically the same diameter, this graft is now fitted in place, the conjunctiva of the graft sutured above and below, right and left to the margin of the conjunctiva of the globe. As many interrupted sutures as necessary are now placed between these, twenty to twenty-four usually being sufficient. These should be of fine silk, not tied too tightly, the ends cut short in order not to overlap the cornea. If the conjunctiva is very elastic I prefer to make the conjunctival flap removed from the patient a trifle longer than the one attached, in order to secure a slight pull, thereby keeping the edges of the graft in close approximation to the sclera of the host, as I consider the quick restoration of the anterior chamber of prime importance. This I have seen accomplished at the time of the first dressing, twenty-four hours afterwards. The eye is irrigated with boric acid, a 1% solution of pilocarpine instilled to keep the iris away from the wound, bichloride of mercury salve (1–5000) is applied, particularly over the puncta, a light but snug bandage is put on both eyes and a Ring mask. The eye is dressed in thirty-six or forty-eight hours, atropia being used as soon as the anterior chamber is restored. Both eyes should be kept bandaged for at least two weeks, and the stitches removed not earlier than eighteen or twenty days, though many will have been found to have cut out by that time. Liquid diet, absolute confinement to bed for the first two weeks, and no purgative for at least five or six days I consider essential.

CASE I.—C. T., age 36. In January, 1912, was burned by liquid ammonia from an explosion in ice plant. Had been under care of various ophthalmologists until seen by me, July, 1913. Examination at that time showed well nourished man of laboring class, poor intelligence. Physical examination revealed nothing. Ocular examination showed surface of lids normal, margins normal, scars on palpebral conjunctiva. Cul-de-sacs were not much shallowed. Ocular conjunctiva scarred, slightly thrown into folds. Scar tissue extending on to the cornea. No symblepharon. Cornea totally opaque both eyes, with slight thinning in scar above left eye. Vision in each eye light perception only. Tension to fingers normal. After keeping patient in hospital for about seven weeks a case of injury was admitted to hospital in which a piece of steel had been driven through the lower lid and through the equator of the eye. Through the kindness of one of my colleagues I was given the cornea from this case, several days after the injury. At this time there showed large quantities of exudate in the vitreous, but several cultures taken from the vitreous on three different media two days before operation failed to show any growth. The graft was removed under ether just before the eye was enucleated, the patient having been prepared in the adjoining operating room. During the time of removing the cornea from the patient in preparation for the graft, the graft was kept in warm saline for about one hour. The steps of the operation were essentially as have described, the patient suffering a good deal under 4% cocaine and holocaine anæsthesia. No vitreous was lost, the iris remaining well contracted during the operation. There was very little bleeding.

First day (at end of twenty-four hours) first dressing was done. No secretion, no pain, cornea clear, epithelium glistening, anterior chamber fully restored, iris contracted, eye quiet. Atropine 1% was instilled, eye rebandaged with bichloride salve dressing.

Second day. Conditions same, iris well expanded. Atropine and dressings same. This remained unchanged until eighth day, when corneal epithelium became very faintly hazy, but cornea retained its perfect transparency, and on fourteenth day patient remarked he could see perspiration on my face. By this time one half of the stitches had cut out. Eye remained quiet, iris well dilated, no iritis, no synechia, sensation to cornea not restored, faint secretion, but no more than one usually finds in an eye bandaged for the same length of time.

Sixteenth day. Slight low-grade infection at stitch near lower margin of cornea, with deep infiltration of cornea about three millimeters towards center, epithelium still intact, though very faintly œdematous. All stitches were removed as union had firmly taken place. Argyrol 25% instilled and patient redressed. From this time on the cornea became rapidly opaque. The epithelium never sloughed off, though it became very soft. The cornea became very soft and somewhat irregular. At the end of six weeks, after treatment of hot applications and dionin the patient was allowed to go home and was not seen for fifteen months, at which time he reported for operation on the other eye, as the first eye had seemingly been a complete failure. Examination showed the cornea totally opaque, slight sensation, slight vascularization from conjunctival vessels.

Tension 20. Vision hand movements.

Was not seen again until February, 1920. Giving the subsequent history. From year to year the vision of the left eye improved slowly until April, 1919. He was able to get about the neighborhood by himself, seeing and recognizing objects about him, living in Fredericksburg, Virginia. Was able to see arc lights four or five squares off at night. Suddenly the eye became very painful. After two weeks of great suffering he consulted a local ophthalmologist, who advised removal. Returned to Washington, I being away, was treated at Episcopal Eye, Ear, and Throat Hospital for ruptured globe. Remained there five days and went home. At present the eye is phthisical. I feel without knowing that secondary glaucoma developed, which very probably could have been prevented if he had been under observation. However, at the end of six years he had partially useful vision after a total transplantation of the cornea.

Case II.—In January, 1915, operation was done on the right eye. The corneal graft in this instance was obtained from a case of absolute glaucoma whose eye was to be enucleated. The cornea was slightly œdematous. The steps of the operation were similar to those described up to the removal of the cornea from the host. As this was being completed it was found that an iridectomy had been done. Just as the cornea was removed, the lens, no longer being retained by the sphincter, was extruded with about one third of the vitreous. With very little hope of success, the graft was placed in position and sutured. The eye was not dressed for seventy-two hours, at the end of which time the cornea was found to be hazy, the eye flaccid, but very little reaction. The corneal haze steadily increased, though the graft held well in position until at the end of three weeks all stitches were removed.

At the end of the fourth week the patient was allowed to go home, the eye still very soft but quiet. He was not seen again until February, 1920, when he presented the following appearance: The globe was full, tension 15, the cornea fibrous, many conjunctival vessels passing through its substance, a few calcareous deposits, complete sensation present over the whole area. No iris could be seen, no line of suture between graft and sclera visible. Vision light perception.

CONCLUSIONS.

1. The ingrowth of fibroblasts and the vascularization of the cornea is less, owing to the size of the graft. The center has a greater chance to remain clear.

2. In the former operations devised, in which the whole thickness of the cornea is not removed, there is much difference of thickness of the cornea and graft, and a great amount of irregular astigmatism, which is obviated in great measure in this type of operation.

3. The life of the graft is more certainly assured, both from the larger conjunctival flap, in close contact with the vascular conjunctiva of the host, and in addition the greater nutritional advantages that the cornea enjoys at its margin.

4. There is no danger of the graft slipping from its position as in all trephine cases, nor is there any maceration of the graft from stitches.

5. The apparent interference with the drainage system of the eye is not absolute, though this may present one great drawback to the operation. In one case the tension remained normal or nearly so for six years before secondary glaucoma developed, and in the second case tension was slightly subnormal at the end of six years.

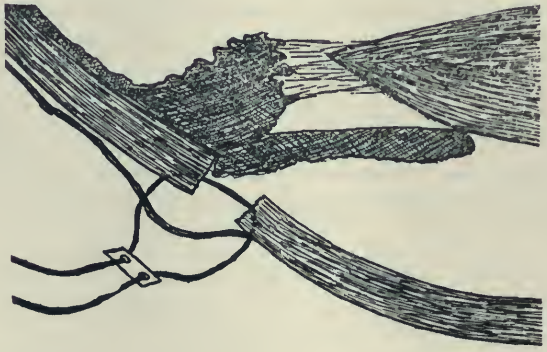
6. I believe that total transplantation of the cornea is a perfectly practicable procedure, in spite of the seeming impossibility of its accomplishment, and that its further development will give us our best chances of good results.

THE CLOSURE OF TRAUMATIC SUBCONJUNCTIVAL CORNEOSCLERAL FISTULA.[1]

By Dr. HARRY S. GRADLE, Chicago, Ill.

(*With one illustration in the text.*)

A SUBCONJUNCTIVAL corneoscleral fistula, or as it is termed, a filtering cicatrix, is a much desired end-result in certain operations for glaucoma and the possible danger of late infection can be neglected in view of the relief of hyper-tension afforded by this scar. But in young individuals who carry such a cicatrix as a result of trauma, the danger of infection through the filtering fistula throughout the remainder of their life is an unnecessary risk. Consequently the eradication of such an area of filtration is a measure the risk of which is justified by the elimination of the danger of future infection. That the risk is not as great as might seem at first blush may be seen by a recital of two such cases.



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[1] Read before the Academy of Ophthalmology and Oto-Laryngology, Kansas City, Mo., October 14, 1920.

Case 1.—A young man of about 23 years came to the Eye Service in General Hospital No. 28, United States Army, for some minor eye complaint. On examination, a one-millimeter corneoscleral subconjunctival fistula was found at the outer limbus of the right eye. There was good subconjunctival filtration as shown by the conjunctival bleb which was about one centimeter in diameter and about two millimeters high. The pupil was distorted and drawn toward the scar, resulting in a pear-shaped pupil, lying horizontally. The remainder of the eye was normal, although the vision was somewhat deficient. The tension was normal.

No history of trauma of any sort could be obtained. The patient did not know of his ocular anomaly and consequently could not place the beginning of the condition. Although it was patently not a congenital anomaly, the time of injury could not be fixed. Incidentally, the patient had the mentality of approximately an eight-year old.

Under local anæsthesia, a large semicircular conjunctival flap with the fistula as a center was dissected free and laid over the cornea, and the fistula laid bare by blunt dissection. A knuckle of iris filled the posterior portion of the fistulous tract while the anterior portion was kept free by aqueous drainage. Eserine was instilled into the conjunctival sac, and with a cyclodialysis spatula an attempt was made to replace the partially prolapsed iris. The iris sphincter contracted promptly, and with the slight mechanical aid an almost round pupil was obtained. The edges of the fistula were curetted lightly with a small sharp knife and a very fine silk suture introduced. The needle was entered into the sclera about one millimeter from the edge of the fistula approximately one half way through the thickness of the sclera. The second bite was taken through the sclera on the opposite edge of the fistula in precisely the same manner, as seen in the accompanying diagram. Tying this suture completely closed the fistula and it was not necessary to make an opening of the anterior chamber on the opposite side of the cornea, as was originally considered, in order to minimize the pressure on the internal side of the fistula. The conjunctival flap was replaced and held in position with two light sutures.

Atropine was instilled and both eyes bandaged. At the daily dressings, both atropine and eserine were used in order to force the maximum pupillary play. After the third day, the conjunctival flap was again laid back and the scleral suture removed, following which the flap was replaced. Healing was uneventful and at the end of ten days the patient was returned to duty. At that time, the fistula was completely closed, there was no conjunctival bleb, the anterior chamber was of normal depth, and the pupil was nearly round, although still slightly oval in the horizontal diameter. The tension was normal.

Case 2.—A sixteen-year-old boy was struck in the right eye with the point of a knife in July, 1919. When seen 24 hours later, he presented a moderately injected globe with a clean incised wound through the corneoscleral margin at meridian 110, extending about three millimeters into the sclera and four millimeters into the cornea. There was a prolapse of a small amount of iris, ciliary body, and vitreous into the wound. The vision was mere light perception and projection owing to extensive hemorrhage into the vitreous. The eye was flushed with oxycyanide and the prolapsed tissue replaced as far as possible and the scleral wound closed with one silk suture. Urotropine was administered per os in large quantities, and under the usual local treatment the eye become pale in three weeks.

In May, 1920, the eye was pale (having remained uninjected for nearly a year). Over the site of the wound was a large conjunctival bleb that had been increasing steadily, although but slightly, in size for the past six months. Underneath the bleb was a one-millimeter corneoscleral fistula. The iris was drawn into this fistula so that the pupil presented the picture of a post-operative coloboma, despite the fact that no tissue had been removed after the original injury. The vision with a minus cylinder was but a fraction under normal, although there was a distinct hypotonicity of the eye.

Under local anæsthesia, a large semicircular flap with the fistula as a center was dissected free and the fistula exposed by blunt dissection. Eserine was instilled into the conjunctival sac and an attempt was made with a cyclodialysis spatula to restore the shape and position of the original pupil. But the adhesions holding the pupil were too dense to be broken by such force as was deemed safe to use. Consequently the endeavor to restore the pupil was abandoned and the fistula was closed with a single suture as in the previous case with the exception that the suture was carried through the conjunctiva and tied over the gold plate used by Wiener in his corneal operations. The conjunctival flap was restored into place, the periphery held with two light sutures. All sutures were removed on the third day.

The course of healing was uneventful, and the patient was discharged from the hospital within a week. To date, the conjunctiva over the site of the former fistula has remained flat and there seems to be no drainage from the anterior chamber. The pupil is still distorted toward the site of the wound and the vision has returned to but a fraction under normal when corrected with a minus cylinder. The anterior chamber is of normal depth and the lens and fundus are normal, as is the intraocular tension.

These two cases illustrate the simplicity of closure of a corneoscleral fistula that is not necessary for the restitution of the balance of intraocular pressure. Although the fistula per se has no influence upon the vision and undoubtedly an eye with such a filtering cicatrix would maintain its integrity throughout the life of the individual, still the danger of infection through the fistula is sufficiently great to warrant the operation and eliminate such a risk.

MINOR PALPEBRAL AND CONJUNCTIVAL AFFECTIONS ASSOCIATED WITH REFRACTIVE AND MUSCULAR ERRORS.[1]

By Dr. JOHN GREEN, Jr., St. Louis, Missouri.

THE major part of the work of any ophthalmic practitioner lies in the fields of refraction and motor anomalies of the eye: probably from 60% to 90% of all who consult us do so because of symptoms arising from uncorrected ametropia or imbalance of the ocular muscles. It goes without saying that each one of us will endeavor, painstakingly, to place upon every patient that particular pair of spectacles which shall aid the eyes to perform the exacting tasks demanded by our complex civilization, and induce in the patient a sense of general well-being and unconsciousness of his ocular apparatus. While the principles underlying the tests are universally understood methods vary, and perhaps, rightly so. "All roads lead to Rome" and equally exact and satisfactory results may be attained by different methods of procedure, adapted to the training and personality of the examiner.

Let us assume, then, that glasses have been prescribed based on a knowledge of the static and dynamic refraction, a determination of the power of accommodation, a prolonged reading test and an estimation and correction (if necessary) of any muscular anomaly (tests being made of the balance for far and near). The routine will include a test of the pupillary reactions an ophthalmoscopic examination and often a mapping of the visual fields. We should inquire into the occupation of the patient and secure some general conception, at least, of his previous state of health and present physical condition.

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[1] Read before American Academy of Ophthalmology and Oto-Laryngology, Kansas City, October, 1920.

Such is the routine which, I presume, most of us follow in the ordinary patient presenting himself with symptoms of asthenopia. We may, in addition, *casually* inspect the lids, ciliary margins, conjunctiva, and cornea, and, failing to find any deviations from the normal, proceed on the assumption that all the patient needs is a properly fitted pair of glasses. Now it is to this "casual" inspection that I venture to raise an objection. Such an inspection often fails to disclose certain minor changes in the lids, conjunctiva, and cornea which may be contributory to the discomfort of the patient; may, indeed, be the sole cause of his complaints. Symptoms arising from these minor disorders,—burning, smarting, itching, stillicidium, foreign body sensation, ocular pain, early fatigue in use, etc.,—closely resemble the symptoms of accommodative and muscular asthenopia. Careful correction of the refraction and any associated muscular trouble must be supplemented by equally careful correction of any conjunctival, corneal, or palpebral disorder. Not every patient with low hyperopia or hyperopic astigmatism requires glasses. Sometimes the symptoms in such patients are due to temporary accommodative weakness incident to recent debilitating illness; they may just as well depend solely on local troubles in the lids, conjunctiva or cornea.

We are all familiar with the conjunctival and slight ciliary congestion, the sensitiveness to light, the epiphora on manipulation, the over-red palpebral margins, which so often occur in the ametropic eye and which disappear when the proper correction is applied. It is not these conditions, so obviously dependent on ametropia, and wholly correctible by glasses, to which I wish to draw your attention. I desire, rather, to discuss certain other abnormalities which, in my opinion, should always be sought for, and if found, removed prior to, or immediately following the refraction test.

As some of these changes are very minute, simple inspection, without magnification, may be insufficient to bring them to light. It is now my invariable practice to inspect the lids and anterior segment of the globe with the Zeiss binocular magnifier, going over, in order, the skin of the lids, the cilia, the intermarginal space, the caruncle, the puncta, the outer angle, the bulbar and palpebral conjunctiva, the upper and lower cul-de-sacs, and the cornea. Such a minute inspection may seem superfluous in patients whose complaints are *apparently* based solely on their refractive error. Often, indeed, nothing out of the way is found. There is, however, a surprisingly large number who present minor pathologic conditions.

Disorders of the Meibomian Ducts and Glands. Normally, the ducts of the Meibomian glands can be seen through the conjunctiva as narrow white lines running vertically to the palpebral margin. Either by reason of increased secretion or by partial blocking of the orifices in the lid margin, these ducts become dilated and appear as wider lines. Not rarely a large number of these can be observed in the tarsal conjunctiva. Vertical incision with a sharp-pointed canaliculus knife, with pressure and gentle curettage will empty these ducts of their oleaginous or caseous material. Often the blocking occurs near the orifices of the ducts, in which case massage of the palpebral margin will cause the evacuation of the contents. I have found the following manipulation effective: the upper and lower (closed) lids are grasped by the forefinger and thumb of one hand. Thus each lid is partially everted and the tarsal surfaces are apposed. The ducts are emptied by pressure combined with a lateral and antero-posterior sliding motion of one tarsal surface over the other. Occasionally, it may be advisable to apply pressure with the thumbnails.

Occult Chalazia. Very small chalazial masses may not present any elevation, either on the conjunctival or skin surface, and may not be palpable. In such cases, the exact location of the mass is difficult to determine. I have found it of advantage to blanch the conjunctiva thoroughly with a cocain-epinephrin mixture, which will clearly define the area to be incised. The tarsal conjunctiva immediately over the chalazion will appear as a darker ring or oval and can thus be readily differentiated from the uniformly blanched tarsal conjunctiva,

Chalazion the Cause of Epiphora and Astigmatism. On several occasions, I have observed that a small chalazion, situated near the nasal end of the lower lid, has slightly everted the lower punctum, thus causing an annoying epiphora which disappeared after curettage of the chalazial contents. We are all familiar with the fact that a large chalazion, by exerting constant pressure, may so deform the cornea as to produce a transitory but regular astigmatism.

Papillary Elevations of the Tarsal Conjunctiva. Frequently the tarsal conjunctiva, in ametropia, presents minute elevations, which appear most abundantly at the upper tarsal edge, especially toward the inner and outer angles. There is little or no discharge. Usually correction of the ametropia associated with a mild astringent collyrium suffices to smooth out the elevations. If, after a few weeks, they still persist, a mild form of expression by means of Kuhnt's or Gifford's forceps is very effective. A very mild conjunctivitis, with the formation of follicles, similar in type to that incident to atropine and eserin irritations, is occasionally seen in association with hyperopia or hyperopic astigmatism. This condition usually yields rapidly to glasses and astringents. If it does not, the lids should be cocainized and rubbed with gauze dipped in boric acid powder.

Vernal Conjunctivitis. In the severe form the diagnosis is, or should be easy. Unfortunately, it is too often mistaken for trachoma and treated on this assumption. On the other hand the mild form (and there are many cases which give rise to symptoms but show very little to inspection) is apt to be regarded as the conjunctival reaction to ametropia, and hence goes untreated, save for correction of the refraction.

Conjunctivitis Due to Food Anaphylaxis. Recently Conlon (*American Journal of Ophthalmology*, vol. ii., No. 7., July, 1919, page 486) has described a mild, but annoying form of conjunctivitis apparently dependent on the ingestion of certain foods in individuals anaphylactic to these foods.

The protein skin test, as described by Walker in his investigations of the cause of bronchial asthma, is applied. Prompt cure has followed the withholding of the offending food material, with a recurrence of the trouble on the resumption of this food.

Caseous Deposits and Concretions. Rarely in children, more frequently in adults, one finds scattered here and there in the normal appearing tarsal conjunctiva, tiny round light yellow masses. On puncture a small spherical or slightly flattened soft or hard, homogeneous mass, can be lifted out. Sometimes they are adherent to the conjunctiva, again they appear to lie free in a tiny cavity. Probably they do not, as a rule, give rise to symptoms, but when elevated above the level of the tarsal conjunctiva may evoke the sensation of a foreign body and then require removal.

Similar deposits are more frequently found in elderly people. They appear as white and yellow specks superficially or deeply situated, generally distributed throughout the tarsal conjunctiva, but showing an especial predilection for the upper and lower cul-de-sacs. They are, according to Parsons (*Pathology of the Eye, 1904*, vol. i., page 93) "the products of degeneration of cells and mucoid exudate in the lumen of minute cysts," which are "retention cysts of glands of new formation, due to irritation, and also of the so-called Henle's glands." Each cystic space contains from one to five concretions. They do not contain calcium carbonate or phosphate. Like all such degeneration products, they stain variously and according to Parsons (*Path. of the Eye 1904*, vol. i., page 94) "belong to that indeterminate quantity—Von Recklingshausen's hyalin." As these deposits may project above the surface and are surrounded by an area of lymphocytic infiltration, it is clear that they serve to perpetuate a low grade conjunctival inflammation. The treatment is simple and satisfactory. Under the magnification of the loupe every individual cyst is punctured and its contained masses lifted or curetted out. This is often a very tedious process, as each lid may contain from twenty-five to fifty concretions, and it is important that the work be very thorough. Such lids often contain many blocked Meibomian ducts and the little operation is best concluded by thumb and finger massage of the edge of the lid.

Illustrative Case. Mr. B., age 60. Complained of "heavy feeling in lids," burning and lacrimation in use. Refraction, R. & L. + .75 sph. V $\frac{6}{5}$. Orthophoria. Bifocals prescribed: R & L + .75 sph. + 2.5 sph. added. Symptoms not improved. Disinclined to wear bifocals. Evacuated half a dozen cysts, removed twenty to thirty concretions from each lid, curetted a small chalazion, and massaged the lid margins. Astringent collyrium of zinc sulphate. Within a week, symptoms improved. After three months, lids normal. Wears bifocals with comfort.

Pinguecula. The vast majority of pingueculæ give rise to no symptoms and require no treatment. In persons exposed to dust, smoke, and other forms of mechanical irritation, these little affairs may have a recurrent inflammation with attendant discomfort. If astringent lotions fail to prevent recurrences, the pinguecula should be excised.

Warts. Small warty growths on the lids or lid margins—verruca senilis—are not at all rare. Sometimes they occupy the intermarginal space. Again one may be found encroaching on or overlapping the sharp inner border of the lid. In such a situation. rapid closure of the lids is apt to bring the rough edge of the wart into contact with the cornea and produce the sensation of a foreign body. Abscission, with cauterization of the base by trichloracetic acid is indicated.

Cysts of Moll's glands are tiny retention cysts which occur at the edge of the lids. A patient is often aware of their presence only by close examination of his lids in the mirror. On the other hand, they may be very annoying by giving rise to a foreign body sensation. They are easily gotten rid of by puncture and pressure-massage. Sometimes the walls of these cysts proliferate, producing more or less solid tumors.

Aberrant Lashes. In lids wholly free from cicatricial changes, and in which there is no distichiasis, I have occasionally observed the presence of a few very fine light colored hairs springing from the lid margin just internal to the normal row of cilia. They tend to curve back and irritate the cornea. They should be destroyed by the electric needle. The lashes at the outer angle may, through spasmodic closure of the lid, be swept backward and caught between the lid and the globe, there to remain until released by a strabismus hook. There is a tendency to recurrence which can usually be overcome by stroking the lashes outward. In one patient a canthoplasty was required. Sometimes a cilium as it emerges from its follicle will burrow under the skin. As it grows, the skin is stretched over it in a tiny tent-like formation. A patient recently observed, who had this condition, stated that her eye felt "drawn" and thought that her glasses needed changing.

Broken off ends of cilia and the short cut ends of the scalp hairs (following a hair-cut) may lodge in the puncta and cause irritation.

Occasionally the tiny hairs of the caruncle grow long, and curving outward and downward, irritate the bulbar conjunctiva.

Foreign Body on the Cornea. Failure carefully to inspect the cornea may lead to the ridiculous attempt to abolish the discomfort arising from an imbedded foreign body with a pair of glasses; such a case has recently been brought to my attention.

Excoriations at the Outer Angle. These little solutions of continuity are often very tiny and may escape detection unless carefully sought for with the loupe. They yield readily to lunar caustic and yellow oxide of mercury.

Spastic Entropion. It should not be forgotten that spastic entropion may not be constantly present and hence may not show during the patient's visit to the office. In the case of elderly persons, I make it a practice to explain the nature of this trouble to the members of the family so that a watch may be kept for the appearance of this annoying condition.

Mild Squamous Blepharitis. The very mild form of this affection is apt to be overlooked. It is so frequently the ocular manifestation of a seborrheic eczema of the skin or scalp that I have found it of great advantage to treat this condition in collaboration with a dermatologist.

I have endeavored to present, as briefly as possible, some of the minor ailments of the anterior ocular segment which may and often do, give rise to ocular discomfort. Some of the symptoms evocable by these ailments are indistinguishable from some of the symptoms due to uncorrected ametropia and muscular defects. A patient's symptom-group may be due partly to these disorders of the lids, conjunctiva or cornea, partly to his need for glasses. Sometimes his discomfort is psychic or dependent upon some general disease. The outspoken conjunctivitis, keratitis, chalazion, etc., makes itself heard and needs no introduction.

If I have been able to arouse your interest in some of the minor disorders, which, though minor, may yet be provocative of great ocular discomfort, the purpose of this paper will have been accomplished.

OPHTHALMOLOGY FROM THE VIEWPOINT OF THE CLINICIAN. WITH THREE ILLUSTRATIVE CASES.

By Dr. HOMER E. SMITH, New York.

Assistant Surgeon, Herman Knapp Memorial Eye Hospital
Visiting Ophthalmologist, New York Diagnostic Clinics.

TO one who has spent half his medical life in clinical medicine and the other half in ophthalmology the two are so indissoluble that he finds it impossible to think in terms of either separately. Perhaps because of his early training he thinks in terms of the former rather than the latter. This method of approach may militate against the refinements of differential ophthalmic diagnoses but it gives a keener insight into the pathologic sequences of the disorder. The medieval concept of disease was based on demoniac possession, the phlogiston theory put an "itis" on every disorganized tissue, but Virchow had prophetic vision when he gave us his cellular pathology, for it is most certainly true that the ultimate decision rests with the germ-cells as to man's physical destiny. To-day diseases are segregated into clinical entities—an illogical division which makes a part greater than the whole. "Diseases are not entities nor even recurrent phases of independent events but are partial aspects of a universal series."[1] The first variation from normality is an aberration in molecular dynamics—here it is that disorder, not disease, begins. The frank and evident manifestations of malfunction are but late aspects of this universal series. Excepting trauma and localized ocular exogenous infections the diseases of the eye are pathologic sequences (of endogenous origin) to septic, toxic, or biochemic changes in the cell and are usually but the smaller part of the morbific process. What makes it of paramount importance may not be the underlying disorder but the menace to the vital function of the organ involved. In analyzing conditions which have brought about diseases of the eye in many instances no account can be taken of the ætiologic factor for, in not a few cases, the disorder comes under the caption "of unknown origin." Gout and diabetes are notable examples of diseases of unrecognized causation presenting ocular coincidences. Again there are cases where the secondary lesion is of so serious and permanent a character that no radical improvement can be expected from the removal of the primary cause. There remains a large group of systemic disorders, with ocular disturbances, which do not admit of the removal of the cause because this is no longer active and we are confronted with lesions in a far-advanced and terminal stage for which ameliatory measures only are possible. There are to be considered always the possibility of concurrent maladies. That a patient has a positive Wassermann does not prove by any means that the ocular disorder is luetic. The writer is far from placing implicit trust in either a positive or negative report, and most of all does he distrust a positive reaction in the absence of any clinical evidences of the disease. Too often have patients been condemned to a life-long dread of disaster, and to actually damaging therapeusis, by a serological report which had only for its basis a technical error. It must ever be held in mind that the discovery of a cause which might explain the malady might not represent the lesion of chief importance, and that any examination is incomplete that leaves uninvestigated any possible source of mischief. The following cases are illustrative of the contentions embodied in this essay—only three are given—they could be added to in scores. In fact every serious ocular malady demands the fullest exercise of the clinician's critical faculty. The first case is presented as an example of how the omission of a single line of investigation, even after the diagnosis seemed conclusive and inclusive, would have led to grave error in treatment.

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[1] Sir Clifford Allbutt, Presidential Address, British Medical Association.

CASE I.—Patient is a native American girl, white, single, age 18. Weaver. Chief complaints—headache, vertigo, vomiting, debility. Nothing of importance in past or family history nor in the personal up to two years ago. At this time attacks of vomiting, without precedent nausea and independent of the ingestion of food, began and were accompanied by severe headaches which the vomiting did not relieve. At first these attacks were intermittent, shortly they became of daily occurrence and there developed vertigo and incoördination of gait of the cerebellar type to so high a degree that six months ago she was compelled to relinquish her occupation. She occasionally has subjective feelings of numbness on both sides of her face, coldness of extremities, and complains of muscular weakness. She is dyspnœic on slight exertion but there is no precordial distress. The physical examination showed an ill-developed and undernourished condition, but was negative in diagnostic indications. The gastrological investigation, after a test meal, showed no chemic or microscopic departures from the normal. The examination of her blood gave a normal picture and the cell count and the hæmoglobin estimate revealed no anæmia. Her pulse rate was high, 100 p. m., systolic pressure, 100*mm*, Hg diastolic 80, pulse pressure 20. This was suggestive of a hypo-adrenemia, but the endocrine tests showed no reaction. Roentgen examination of chest and abdomen revealed a visceroptosis and the drop heart characteristic of chronic congenital asthenia. The urinary tests and the Wassermann were both negative. Up to this stage, while the alert clinician would have his suspicions aroused, there was nothing brought out explanatory of anything but the general debility and this was due to congenital deficiency of structure. The eye examination showed a corrected vision of $\frac{20}{20}$ in both eyes. Accommodation normal as were the pupillary reactions although both pupils were evenly large and reacted slowly. Fields for form were normal but marked contraction, symmetric, for colors. The ocular rotations were perfectly performed and there was no nystagmus in the primary position, but this could be elicited on extreme lateral rotations and convergence. This was not assumed to be necessarily pathologic. The eye grounds showed bilateral papillœdema—swelling of the disks, 1.3*mm* in right, 2.00*mm* in left. Diagnosis, intracranial neoplasm—probably cerebellar. Treatment advised—subtentorial decompression to relieve symptoms and to save vision. The neurologic summary of Dr. Charles Rosenheck is here given in full. "The history, clinical course and neuro-ophthalmologic findings, clearly indicate the presence of an intracerebral growth. Its exact localization is impossible at present in view of the absence of definite focal symptoms. The moderate cerebellar dysenergia (ataxia and diadochokinesis) naturally presumes its location to be subtentorial. The absence of frontal lobe symptoms (emotional or intellectual deterioration) precludes this localization notwithstanding that tumors in this region often also induce ataxia. Although patient should receive the benefit of anti-leuetic treatment for some weeks, serious consideration should be given an early decompression to avert impending blindness." The oculist would most likely have been satisfied with such an investigation, but the clinician felt it would not be complete without a stereo-roentgenogram of the skull. This was made. The report says "Destruction of the dorsal sella and the anterior clinoid processes. The roof of the sphenoid is unimpaired." This verified the diagnosis of intracranial tumor and gave positive proof of its location. The absence of pituitary symptoms is common when the whole gland is destroyed, so there were none of these to give a clue to its location. The cerebellar symptoms were pressure or œdema effects and instead of the serious subtentorial operation, which would have given little or no result, the comparatively trivial subtemporal decompression is now clearly indicated.

CASE 2 is presented to illustrate the folly of attributing purely to ocular instabilities concurrent psychic or somatic phenomena and that "neurasthenia"—however satisfying this pseudo-diagnosis may sound to the incompetent practitioner—may be a sentence to close confinement to the unfortunate victim of this medical blunder. The patient—native American—male, white, married, merchant, aged 41. Chief complaint—inability to concentrate the attention when any attempt is made to use the eyes for close work associated with vertigo and confusion of thought. There is nothing in his family or past history, up to three years ago, that has any bearing on the case. He then had what his physician called a "nervous breakdown" and was compelled to give up business. At this time his chief complaint and greatest source of trouble was double vision, the false image being higher than the true—after a prolonged rest this disappeared but on an attempt to resume work aprosexia, vertigo, and confusion became so marked that again business became impossible. He was unable to walk even a block up on the street, as the moving figures induced such vertigo that he would fall unless supported. The psychic effect of all this brought on despondency and reacting upon his physical status his nutrition suffered. His vision O.D. with + 0.25 ◯ + 0.50 axis 65 equalled $\frac{20}{15}$. O.S. with + 0.25 ◯ + 0.25 at 90 also equalled $\frac{20}{15}$. With the phorometer he had orthophoria in the distance. Parallax showed a slight left hyperexophoria. He had binocular single vision in all parts of the field excepting the left lower lateral. Here he had crossed diplopia, the image belonging to the left eye standing lower. Analyzed, this indicated underaction of the left inferior rectus and an overaction of its synergist, the right superior oblique. He was given his sphero-cylindric correction and superposed upon this, in the infero-temporal quadrant of the left lens, a 3^{Δ} paster, base down. I then returned him to the referring physician with the following report. "Inasmuch as this patient comes from his former physician with a diagnosis of 'neurasthenia' I am moved to express myself somewhat at length upon my own concept of this confession of incompetency, for in every case I so regard this totally inadequate diagnosis. When there have been eliminated: (1) Dilated or insufficient hearts and especially the type which is characteristic to the congenital astheniac; (2) renal inadequacy, not necessarily expressed by a low urea output or albuminuria, but by a high non-protein nitrogen or creatinin content of the blood; (3) active but obscure pulmonary tuberculosis; (4) larval syphilis; (5) cryptogenetic sepsis; (6) the atypical dyscrinisms and (7) the anæmias—then the cases remaining to be labelled with this pseudo-diagnosis would be very few indeed. I trust you will not think I am attempting to be didactic but believe I am simply expressing my aversion to this deplorable lack of scientific precision. This patient is 41 years old and only within the past three years has the ocular condition, which is frankly an anatomic anomaly, come to the fore as a disturbing factor. It has made itself evident simply because of the nutritional depression incident to one of the causes previously mentioned. To attribute all his symptoms as being purely ocular in origin to my mind is unthinkable. By this I am not to be understood as considering the ocular condition a negligible factor in the case, nor one unworthy of meticulous attention, but to expect a cure from treatment of his eyes alone, be this optical or otherwise, would be unwarranted. To make a comprehensive search into causes there are suggested: A teleroentgenogram of his heart, a stereoroentgenogram of his chest, a blood chemic analysis for creatinin and non-protein nitrogen, a phenolsulphonephthalein test for renal permeability, a search for septic foci, teeth, tonsils, appendix, prostate, gall bladder, kidney. An investigation into an autotoxic condition from intestinal sources, an urinary analysis for indican, the acetone bodies, the urea percentage, the phosphates, chlorids, or any abnormal content or proportion, a cytologic blood examination including a differential count and the hæmoglobin estimate and lastly an investigation into the endocrine functions. The Wassermann tests previously made are reported as negative. This was to be expected as there seems to be no suspicion of a luetic infection. (Here followed the ocular findings as given in detail above.) It is not expected that this searching scrutiny needs to be carried to its ultimate conclusions but only so far as will establish beyond doubt the cause or causes of the disturbed nutrition." The subsequent history is as short as the results were satisfactory. Only part of the investigation needed to be given. The cause was found to be a toxicosis of intestinal origin, and from high colonic lavage, disinfection and localized implantation of the Bacillus Bulgaricus in less than two months the patient was restored to health and the ocular muscle imbalance was no longer in evidence in any part of the field.

CASE 3 is quoted as an illustration how, after a most searching investigation into causes, an evident ophthalmic condition had to be left without adequate explanation. Male, white, native American, widowed, dentist, aged 69, comes with his chief and only complaint of poor vision, which is of such degree that no longer can he see to read or do his work properly. Nothing of importance in his family history. Past history revealed one fact which in the synthesis of the case was considered of prime importance. During boyhood he had so severe an attack of scarlet fever, with associate kidney involvement, that his life was in jeopardy. Following recovery there were symptoms of myocardial inadequacy which were persistent during adolescene. No other facts of importance elicited. Ten years ago noticed failing vision in left eye which gradually passed into complete loss of sight. A few months ago, with the remaining eye, began to be conscious of difficulty in reading and in his work and that distance vision was as looking through a cloud. Vision in the right eye $\frac{10}{200}$, in the left, indeterminate. The ophthalmoscope revealed in the left eye complete primary optic nerve atrophy. In the right over the eye-ground were evenly disposed innumerable small capillary hemorrhages. The nerve head was normal and the blood vessels apparently so as to size, lumen, course, distribution, and absence of perivascular infiltration. These hemorrhages were not the flame-shaped type of uremia nor the discrete droplets of diabetes. Moreover the urine was normal in every particular. The coagulation time of the blood was normal (3.5 minutes) which ruled out hemophilic tendencies and excepting a rather high non-protein nitrogen content the blood examination showed no departure from normality. Leukæmia was thereby eliminated. There was nothing in the eye-grounds or elsewhere to suggest tuberculosis nor were there found any foci of cryptogenetic sepsis. There remained only two unexplored sources of trouble, viz., syphilis and vascular disturbances. The pulse rate was 69; the systolic blood pressure was 140 *mm* Hg.; diastolic 60; pulse pressure 80. There was a pronounced murmur over the base of the heart with the second sound and a roentgenogram showed a marked aortitis and dilatation of the aortic ring. Inasmuch as 80% of such lesions are syphilitic, a Wassermann was taken, this proving negative a provocative salvarsan injection was made with a like result. At the time of the second test his renal permeability was investigated by the phenolsulphonephthalein test and a minor renal inadequacy established. In percentages, there came through in the first hour, 37 as against a normal of 50 and a total in two hours of 55, as against a normal of 75 to 90. Now have been established a diagnosis of aortic regurgitation, endomyocardial degeneration and renal inadequacy due to scarlatinal infection in boyhood but this leaves the cause or causes of the intraocular hemorrhages in the realm of conjecture. Were these due to capillary stasis, to the back-lash of the high pulse pressure or to biochemic changes in the blood itself? We are left in doubt and also is lacking an explanation why there should have occurred a primary optic nerve atrophy in the other eye. It is axiomatic that there can be no accurate or scientific treatment without precision in diagnosis. Failure in the latter comes about from (a) taking insufficient time to analyze all the possible factors in the case; (b) the considering of secondary effects as primary causes; (c) a premature assumption of the obvious forgetting that the obscure may be of even greater importance; (d) overlooking concurrence of disorders. Ophthalmic diagnosis does not end in nomenclature. A convenient label does not take cognizance of ætiologic factors, pathologic sequences, congenital deficiencies, hereditary tendencies, environmental and occupational influences, nor of collateral and consequent complications. The analyzes of all these do not present insuperable difficulties, but it is in the synthesis, the integration of the data, the rejection of the unimportant, and the correlation of the essential that distinguishes the clinician from the mere practitioner. Even as did the mythical filament lead the hero to the hidden princess so does the ingenious clue of golden thread run through the maze of diagnostic perplexities. To find this clue, to follow it to the end and not be tempted into dubious claustra is that which makes of ophthalmic diagnosis the most fascinating of all pursuits.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE

By Mr. H. DICKINSON, London.

An ordinary meeting of the Section was held on December 10, 1920, the President, Dr. James Taylor, occupying the chair.

Mr. N. Bishop Harman showed a patient the subject of **leontiasis ossia, unilateral, associated with optic atrophy.** The skiagrams he exhibited showed that the thickening of bone was rather diffuse. The girl had been under observation 2½ years, and the only noticeable change during that time was a slight proptosis of the right eye. The optic atrophy, however, was on the increase. There was now a slight perception of light in the nasal and temporal fields, but the sight had practically gone.

Mr. E. H. E. Stack (Bristol) spoke of a case he had in 1900, the leontiasis affecting the whole head; it had been slowly growing 21 years. He secured half the skull after death, and the noticeable feature was that none of the foramina at the base of the skull were even slightly affected, although vault and face were greatly involved in the change. It was a diffuse bossy leontiasis. At one spot the skull bone was 3 inches thick. There was no interference with brain or nerve function. During visits to a department of the hospital it had been assumed to be a case of hydrocephalus. Death eventually took place from diphtheria. Her head had become so enormous that her forefingers had become dislocated outwards from continually supporting the head, which was her usual resting attitude.

The President considered the special interest of the case was the optic atrophy. He remembered only one similar case, that of a gentleman he saw 12 years ago who used to come to London every year to procure a larger hat. The subject felt the increasing weight of his head. He was also deformed in certain other ways. He had no headache or optic atrophy; the latter he considered a rare complication.

MR. HARMAN also demonstrated a new scotometer, the chief features of which were the taking of a record on carbon paper, the speed and accuracy with which it could be done, and the hiding of the observer's hand from the patient. Successive observations could be taken on the same chart, which extended 26° laterally, and 17° vertically each way.

He showed, in addition, a frame with vertical adjustment for use in observations on hyperphoria. He said that in certain cases which had unequal eyes there was a false hyperphoria, due to the prismatic action of lenses, which it was difficult to correct for near vision. In this apparatus, one limb was detached from the frame and connected by a telescopic arrangement with a rack-and-pinion, enabling one cell to be shifted above the other. There was a range of 10*mm*, enough to give correction for ordinary hyperphoria.

MR. W. H. MCMULLEN exhibited a Peters campimeter, which he described. The obvious criticism was the very short working distance, and the fact that the field marked out was in the observation of the patient. There were some cases in which it might be useful.

Leprosy of the Conjunctiva.

MR. H. NEAME showed a case of **leprosy involving the conjunctiva.** He said it was a rare kind of case: the last he could find recorded in England were two by Mr. Treacher Collins in 1909, reported in the *Transactions* of the Ophthalmological Society. The patients were father and son, aged respectively 45 and 15, of Polish nationality, though the father had left that country twenty years before, and had noticed nothing amiss with his eye until five years before being seen by Mr. Collins. The boy had had it only two years, and his condition was much more severe. The infection of the patient now being shown occurred in India, and the first indication of the disease was the occurrence of spots on the forearm. He had now a widely extended eruption over the body. The pupils were fixed, the knee jerks brisk. The voice indicated the presence of a degree of nasal obstruction, and there was a sanious nasal discharge from the ulcerated nasal mucous membrane. In this discharge lepra bacilli were very numerous. The lids and surrounding skin were infiltrated and œdematous. Vision in the right eye was $\frac{6}{18}$, partly improved with a sphere to $\frac{6}{12}$: left $\frac{6}{36}$, improved to $\frac{6}{18}$. There was no improvement with cylinders. The patient had had eight intravenous injections of sodium morrhuate, but without producing any apparent reaction or improvement. Then he had injections of sodium chaulmoograte intravenously, as used by Sir Leonard Rogers, from 1*cc* to 4*cc*. After a somewhat larger injection he had a vigorous reaction two days later. Rogers had a series of very hopeful results from this treatment, especially in leprosy of three years' standing or less. The drug was supposed to act by the bacilli, which, in forming their capsule, absorbed some of the fatty acid, which was inimical to the bacilli's growth. He was continuing the treatment; the patient himself considered there was improvement.

MR. TREACHER COLLINS spoke of a case in a man from Rangoon, who had a completely opaque cornea on one side, and parenchymatous keratitis on the other, and he was beginning to get nodules on the sclerocorneal margin. Peritomy had been done in his first eye, and the patient thought progress of the disease was delayed by it. The speaker, at the patient's request, did peritomy in the other eye, but it did not make any difference. It was easy to diagnose ocular leprosy from the clinical appearances. Another case was in a boy from Cork, who probably caught it from his father, who had been living in Riga.

MR. M. S. MAYOU said the nasal mucous membrance seemed to be nearly always involved, and cultures from that revealed bacilli in plenty; there was no need to excise a piece of conjunctiva in order to make the diagnosis.

The case was also discussed by MR. GRAY CLEGG, MR. LESLIE PATON, and MR. TRAQUAIR.

MR. HINE exhibited a patient with an **implantation cyst of the iris.** The patient, a woman, had had the cyst twelve years. In 1908 she had a penetrating wound at the limbus of the left eye from a blow. Iridectomy was done. A month or two later she returned with a pearly looking cyst at the site, along the margin of the coloboma. With a small cylinder she had $\frac{6}{6}$ vision in that eye, and she experienced no trouble from the cyst. Therefore he proposed to leave it alone.

MR. McMULLEN showed a case of similar nature, with an eight years' history, and several members recorded cases in which the results of operations for these cysts had not been good.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. CONRAD BERENS, Jr., Secretary.

MEETING OF NOVEMBER 15, 1920. DR. A. E. DAVIS, CHAIRMAN.

Doctor Isaac Hartshorne reported a case of **pulsating exophthalmos** in a girl of 12 years, due to a traumatic rupture of the internal carotid in the cavernous sinus which was cured by ligation of the common carotid artery with preservation of vision.

Dr. I. Hartshorne reported on a case of **serous sympathic uveitis** in a girl, 9 years old, who one month previously had stuck scissors into her left eye.

The left eye was soft, slight ciliary injection, pupil eccentric, being pulled to nasal side by anterior synechia. Condition of lens and fundus not seen because of marked photophobia.

The right eye presented photophobia and lacrimation, ciliary congestion. Pupil of medium size and sluggish. Five or six small deposits on Descemet's membrane. The left eye was enucleated.

Treatment of the right eye consisted in hot compresses, atropine; sodium bicarbonate, ten grains t. i. d., were given internally and sodium salicylate was administered during the six weeks in periods of five days with an intervening rest of five days. During the first period 45 grains a day was given, during the second and third 50 grains, during the fourth 30 grains. The weight of the child was 50 pounds. During the last three weeks she was also given hydrarg. cum creta one half grain t. i. d.

Under this treatment the inflammatory symptoms in the right eye rapidly subsided. The condition in the eye ground cleared up so that at time of discharge, though the disk was still slightly blurred, it was normal in color, and the eye ground was otherwise negative. With corrective glasses vision was $\frac{20}{30}$.

DISCUSSION: DOCTOR DUANE enquired if any cases of poisoning had been noticed with these large doses of the salicylates. He recalled a case in his early hospital experience, in which the medicinal administration of high doses of the salicylates had produced poisoning with the characteristic color of the urine and speedy death.

DOCTOR CLAIBORNE said that while gigantic doses of salicylate of soda might be, and in fact were, of benefit in the treatment of sympathetic ophthalmia, he saw no reason why doses should be regulated by weight rather than individual susceptibility.

DOCTOR WOOTTON said that he thought the dose of the salicylate depended more upon the susceptibility of the patient than upon the body weight and that these two features did not always have a constant ratio. The main point was to push the drug until constitutional results were produced. Before the advent of this treatment, he had never seen a case recover that had been diagnosed as sympathetic ophthalmia; since that time he could remember four of his own cases, so diagnosed, in which recovery took place.

DR. KRUG stated that some years ago he had seen a case of iridocyclitis following an injury, in which there was a positive specific history and positive Wassermann, and that this case recovered under anti-syphilitic treatment. Are all cases of sympathetic iridocyclitis true sympathetic ophthalmia?

DOCTOR COHEN said that he thought that the combination of sodium bicarbonate with the salicylates, might prevent marked toxic affects, and still not interfere with the usefulness of the salicylates.

DOCTOR DAVIS said, in cases of sympathetic ophthalmia where he had resorted to the salicylates, the stomach was upset by the medicine. He frequently resorted to the administration of the salicylates by suspension given by the rectum. In this way the patient could be put fully under the influence of the drug without upsetting the stomach.

DOCTOR BEN WITT KEY reported a case of **relapsing uveitis.**

S. M., male, 21 years of age, on November 7, 1917, while opening a box, a nail struck and penetrated his right eye. The eye was removed one month later and while he complained of weakness and discomfort of the other eye, almost from the time of the accident, it was not until two or three days following enucleation that the vision became cloudy and the eye slightly inflamed and somewhat painful. Under careful treatment the eye improved, but many floating spots would appear and his vision at times would become so reduced he could hardly get about alone. This condition recurred in attacks, the exact number he could not remember because of the irregularity of their occurrence and the tendency for the eye to become worse as soon as treatment was discontinued.

He was seen by me on August 22, 1919, almost two years following the accident. Examination of the right socket elicited nothing abnormal. The left eye presented the typical picture of a low-grade plastic uveitis—slight pericorneal injection; faintly hazy cornea, a Descemetitis of cream-colored spots; anterior chamber deep; iris partly dilated and attached to the lens capsule, almost annular in extent, and the pupillary space covered by a very fine film of plastic exudate. Vision was $\frac{20}{200}$. The media was hazy and there were many fine floating particles in the vitreous, so that the fundus could not be made out. At the Infirmary the regular laboratory tests proved negative, except for a moderate anæmia. X-ray plates of the sinuses and teeth were also negative. T. O. gave a local and general reaction. Hot bathing and atropine locally, and $\frac{1}{1000}$ of a *mg* of T. R. every four days, brought about a gradual recovery, $\frac{20}{25}$ vision, a fairly clear vitreous, the fundus showing a general moth-eaten appearance, the ravages of a low-grade disseminated choroiditis. On November 28, 1919 (two months after his discharge), the eye showed precisely the same picture as that observed at his first visit to me. He was readmitted to the Infirmary December 19, 1919, where the eye gradually recovered as before under the same course of treatment. He was discharged February 13, 1920, with $\frac{20}{30}$ + vision. In spite of continued home treatment he returned on April 15, 1920, presenting the same condition of the eye as that when first seen, and again for the third time in the Infirmary the condition subsided and he was discharged May 4, 1920, with vision of $\frac{20}{25}$ −. It was then decided that perhaps his home environment and occupation might be the principal factor in bringing on these relapses. He was therefore urged to seek employment on a farm and was fortunate to secure a position where light work out-of-doors was his daily routine. His diet was carefully regulated in an attempt to increase his intake of milk and eggs to the maximum and every effort made to build up his physical strength and resistance. These measures proved to be highly gratifying, because from May to September there was no relapse, during which time he was kept under observation. But on September 25th, he again returned only to show the same low-grade uveal process again active and reducing his vision to $\frac{20}{200}$. He was admitted to the Infirmary at once and for the fourth time has slowly recovered. The eye is now quiet; the plastic exudate entirely disappeared; deposits on Descemet's membrane faintly visible; vitreous fairly clear; fundus, as already described, showing no gross lesion, but a low-grade disseminated choroiditis. In an effort to study his diet and determine even remotely the probability of a hidden focal infection, I referred him to Dr. Ramirez for a protein-sensitization test. The report of this examination shows negative reactions to the common foodstuffs, but a definitely positive reaction to both staphylococcus aureus and streptococcus nonhemolyticus, thereby indicating no particular dietary disturbance, but rather a hidden focus of infection.

May I ask for an expression of opinion as to any further investigation of the ætiology of this case, also as to treatment, including the advisability of an iridectomy. My conclusions have led me to regard this case as one of tuberculous uveitis in which treatment must be extended over a long period of time—excluding the probability of a hidden focal infection, and certainly syphilis, sympathetic ophthalmia, and a dietary or gastrointestinal condition.

DISCUSSION: DOCTOR TYSON asked if the Wassermann had been taken; he received an affirmative reply that it was negative.

DOCTOR CLAIBORNE enquired about the teeth. DOCTOR KEY stated that although X-rays were negative two suspicious teeth had been removed.

DOCTOR BERENS asked if a culture had been made from the apices of the extracted teeth and received a negative reply.

Doctor Key reported a case of **accommodation in the aphakic eye.**

M. J. H., 60 years of age, had a combined extraction performed in each eye four years ago, 1916. The pupillary spaces are large, clear, and transparent; the iris pillars are in position; no secondary operation being necessary in either eye, so that the posterior lens capsule in each eye remains intact. At this time vision in each eye = $\frac{20}{13}$ −2, with the following correction:

O. D. + 13.50 + 1.75 × 15°.
O. S. + 12.50 + 1.75 × 40°.

and with the same combination he reads the finest Jaeger at 14 in. with either eye, this without facial grimace or apparent muscle effort, the upper lid being lowered in its natural position.

Following the operations, he returned to his previous occupation, and has used his distance glasses constantly for distance and near, never conscious of the need of a special reading glass. I was unaware of this fact until a few days ago when he asked me why I had prescribed reading glasses for him, since he had rarely used them, although his occupation necessitated very consistent and daily use of his eyes at office work. He stated that, when reading, the only difference between the effect of the distance glasses and the reading glasses was, that with the latter print appeared to be magnified.

Everyone here is probably familiar with the usual explanations given for these cases—namely—extraocular muscle compression of the globe which is believed to be an important factor in children; vitreous molding or compression as result of the action of the ciliary meridianal fibers, and possibly supplemented by extraocular muscle effort; pin-point opening or stenopaic slit effect produced by the character of the secondary membrane or by drooping of the lid over the pupillary space almost to the lower pupillary margin; the factor of high visual acuity and the education of this faculty.

Discussion: Doctor Duane said that the apparent accommodation in this case was due probably to the fact that when the patient looked down as he did in reading, the lids drooped sufficiently to make a stenopaic slit of the pupil, and that in that case, too, the oblique direction of the gaze practically converted the lens into a stronger one. If the patient looked straight forward with the lid raised, it was observed that he could no longer read.

DOCTOR CLAIBORNE spoke of a patient, 60 years old, who was able to read with distance glasses as near as 5½ inches in each eye and used the distance glasses preferably for all reading. There was also considerable range of accommodation. This was not due to the stenopaic closure of the lid because the patient saw equally well with the lids lifted.

DOCTOR DAVIS: Apparent accommodation in the lensless eye, interests me very much. I reported two cases of this nature and gave a complete review of the literature some years ago. There has always been a dispute in these cases, as to whether there is accommodation present or not. Donders always maintained that in aphakia, not the slightest trace of accommodation remains. On the other hand, Förster, Von Gräfe, Loring, and others contended that an accommodation did exist in such eyes. Both of my cases were in aged people where there was a combined extraction. The first case was forty-two years of age and the other, some fifty odd years of age. The first patient could read with his distant glasses without changing their position, Jager's No. 1 from 8 to 20 inches. The second patient, by preference, could read Jager No. 1 from 7 to 8 inches with her distant glasses. In this case, however, the distant glass was very strong + 16 D, combined with + 2.50 cylinder. In each of these cases, though combined extraction was done, there was a fairly narrow pupil of about three millimeters wide at the narrowest point and six to seven millimeters at the broadest point. Most careful tests were made in these cases to ascertain how the patient was able to read at the near point with the distant glasses after the lenses had been removed. The eye lids were held from the eye balls, atropine was instilled into the eyes in order to eliminate any lid pressure or any action of the ciliary muscle, but with the lids held apart, with the atropine in the eye, they could still read Jager No. 1 at the near points indicated above.

The explanation of how they were able to accomplish this feat, may be explained from three points of view. First, rather narrow pupil. (The late Dr. Loring, however, reported one case, the pupil not narrowed, but being entirely clear, and round who could read from 5½ to 20 inches with the distant glasses.) Second, the magnification of the correcting lens which magnifies the images to about twice the normal size on account of the nodal point being moved forward, thus enlarging the images. Third, these patients learn to interpret diffusion circles on the retina. This is illustrated sometimes in cases of very high hypermetropia where the patient, instead of holding the print far from them, will reverse the process and hold it very close to the eyes, which might lead the unsuspecting ophthalmologist to think that the patient was myopic. Of course, in these cases, the images are very greatly enlarged and the patient can interpret the diffusion circles to better advantage than the smaller images when the print is held far from the eye.

Dr. Duane presented a modified **Prince's rule,** which had been put on the market at the suggestion of Dr. Martin Cohen. Latterly it had been almost impossible to secure the ordinary Prince's rule, and Dr. Cohen had gotten Gall and Lembke to make up a cheap, but satisfactory substitute. The slight modifications suggested by Dr. Duane from his experience were:

(a) The removal from the rule of the scale of ages which was not in accordance with the realities and was of little service anyhow.

(b) A finer graduation at the distal end of the scale (into eights and quarters of diopters).

(c) Placing the zero point not at the proximal end of the scale but about a quarter of an inch from it, so that when this mark was placed, as it should be, at the anterior focus of the eye (practically at the plane of the patient's glasses), the end of the scale could rest against the cheek.

Dr. Duane also showed the form of **accommodation test** that he had come to as the most satisfactory. The accommodation disk with black cloth background, which he had previously described, was difficult to make and expensive. He had found that a simple black line engraved on a small white card served the same purpose. These cards, being furnished very cheaply could be thrown away when soiled. An ordinary spring clip is used as a carrier.

He pointed out the importance of testing the binocular as well as the monocular accommodation. The former is regularly higher than the latter, evidently because in binocular vision the convergence is called into play, thereby stimulating the accommodation. But the difference between the two varies according to varying factors, which should be determined. It is the binocular accommodation that gives us in general our best measure of the most suitable glass, but the monocular accommodation should be tested, too, in order to discover whether there is any difference between the accommodative power of the two eyes, a difference which may have to be taken into consideration in prescribing the glasses.

DR. A. S. TENNER: **Resection of the tarsus and conjunctiva (combined excision) with new instruments and a review of 300 cases.**

Abstract: The indications for operation briefly include all cases of active trachoma with evidences of the formation of cicatricial tissue or those cases with such development of granulation and thickening that the formation of cicatricial tissue is inevitable. If there is pannus, it should be done to relieve the pannus; if there is no pannus, it should be done to prevent the pannus. Local anæsthesia is preferred. The speaker described his method of anæsthesia in detail, the essential feature being the following up of the conjunctiva by the injection, thus dissecting the conjunctiva by fluid instead of by sharp instruments and by this means preventing post-operative adhesions. The forceps and knife designed by Dr. Tenner were shown and their features and advantages described. The results in three hundred cases performed by the speaker in Turkey and Syria during 1919 and 1920 were almost uniformly excellent and he believes that this operation affords the only means of a quick eradication of the disease and of prevention of its consequences and sequelæ.

DISCUSSION: DR. E. TÖRÖK: I received my early training in Ophthalmology in Budapest, Hungary, a country where trachoma was at that time very prevalent. In fact, it became so dangerous to the population that in 1896, the Hungarian Government offered a prize of two thousand crowns, a considerable amount of money then, for the best paper on "Treatment of Trachoma Cases." The prize was awarded to Kuhnt for his paper on the "Excision Operations" for trachoma, which was published in 1897. From that time on excision operations were used very extensively and during the time I was connected with the Hospital from 1898–1907, several thousands of these operations were performed. The operations performed were "excision of the cul-de-sac," "excision of the tarsus," and the "combined excision of the tarsus and conjunctiva," this latter operation, according to Heisrath, as modified by Kuhnt, commonly called the "Kuhnt-Heisrath" operation. Based on several thousands of excision operations it was found that the excision operation was in most cases beneficial to the patient afflicted with trachoma and it was also ascertained that the so-called cure in trachoma was obtained much quicker after these operations than without them. It was also found that recurrences were less frequent. Our experiences have borne out Kuhnt's observations, namely, that without the excision operation only about 10% recover, while with, the excision operation approximately 50% or 60% do. This refers, of course, to the excision of the fornix and the combined excision of the tarsus and conjunctiva. The beneficial influence the excision of the tarsus has upon a trachomatous trichiasis is well known and I believe not doubted by anyone. It is a well-established fact that this method is the best and the only cure for this condition, and is far superior to any other method.

The indications for these operations, as established, based upon several thousands of these operations are as follows: Excision of the cul-de-sac is indicated where the conjunctiva is hypertrophic, the epithelium is thickened and there are a great number of follicles in the cul-de-sac, which run together into large gelatinous masses, but only in those cases where the tarsus is not seriously affected and infiltrated.

Combined excision in cases similar to the above where the tarsus is also thickened and infiltrated, if it contains follicles, and if it shows a beginning cicatricial contraction. In cases where, in spite of long medical treatment, no improvement has been obtained and there is a pannus present on the cornea, which does not show a tendency to clear up. Where trachoma has caused ptosis. In cases where only one eye is affected, as the short period of recovery resulting with this operation will greatly increase the possibility of keeping the other eye from becoming infected with trachoma. The excision of the tarsus, of course, is indicated in old trachoma cases, where the tarsus shows cicatricial contraction; eye-lashes trichiasis; conjunctiva is thin, free from infiltration and follicles, and also shows cicatrization.

All three operations were found contraindicated in fresh cases of trachoma, also in very old cases of trachoma where the conjunctiva is greatly shortened and shows signs of beginning xerosis. This latter condition, however, does not contraindicate the excision of the tarsus alone. The excision operations are also contraindicated in cases where not only the tarsal conjunctiva and the cul-de-sac, but also bulbar conjunctiva show a great many follicles. It was found that in quite a number of cases a slight, acute recurrence followed the operation, which manifests itself in a fresh attack of pannus on the cornea, or an increase in the pannus, if it was present before the operation. This pannus, however, usually clears up in a short time.

Medical treatment should always follow the excision operations and the usual treatment of silver nitrate, or bichloride rub should be applied about two weeks after the operation and should be continued for several months afterwards.

DOCTOR WOOTTON said that ten years experience with the Heisrath-Kuhnt operation, had confirmed his previous opinion of its great value and that it constituted the only efficient treatment of trachoma in which pannus was present or was imminent. The results were always good and frequently the cure was complete in so far as the pannus was concerned. Relapses were infrequent, generally of slight moment and easily managed. He preferred general anæsthesia.

DOCTOR CLAIBORNE referred to his paper published in the ARCHIVES OF OPHTHALMOLOGY in 1912, wherein he described his operation, and a clamp for holding the lids, which he demonstrated. The clamp had five spikes, one in the center and two on each arm, the instrument being a modification of the Desmarres' clamp. He referred to an instrument of Miss Erhardt's of the New York Eye and Ear Infirmary, which he considered to be inefficient, as he had tried a similar instrument himself in experimentation. He established precedence for the performance of this operation by a special constructed clamp. With this instrument the operation could be performed in fifteen minutes and practically without any blood; the surgeon could do it without assistance. He pointed out that Dr. Tenner's instrument was practically the same as Miss Erhardt's.

Doctor Berens said that he believed that Miss Erhardt's instrument differed from Doctor Tenner's and Doctor Claiborne's in that it did not have the traction feature of Doctor Tenner's nor the double arms of Doctor Claiborne's.

So far all the discussion has been in favor of tarsal resection; more emphasis should be placed on the non-operative, home and office, treatment of the patient. He is treating two patients, brothers, each of whom has had one eye enucleated as the result of trachoma. The disease has progressed in spite of the tarsal resections, because the patients were not sufficiently impressed with the necessity for frequent treatment continuing long after an apparent cure. Although the corneæ were completely covered by pannus, constant treatment over a period of two years has given these patients useful vision. He has not found it necessary and does not think it advisable to excise the tarsus in trachoma even in the presence of marked pannus, except to correct ptosis. Conditions in a large city differ from those Doctor Tenner encountered, and where patients can be examined and treated daily, nonsurgical treatment should certainly be tried out thoroughly before resorting to operation. Then the latter course will usually be found unnecessary. Education of the patient to the necessity for frequent and long-continued treatment is the most important single factor in the care of trachoma.

Doctor Cohen advised that the marginal incision, through conjunctiva and tarsus at the central portion, should be horizontal in order to prevent any deformity. He considered the Heisrath-Kuhnt operation advisable in all cases of trachoma, except when a mucopurulent secretion was present.

Doctor Guttman said that he had described this method of anæsthesia 20 years ago.

Dr. Tenner, in conclusion, stated that he agreed with Dr. Wootton that keeping the incision in the tarsus always equally distant from the lid border, that is, geometrically parallel, is most important. He believes the knife, which he exhibited to the meeting, with its small cutting edge enables one to do this far more readily than any other scalpel. The distance from the lid border is not so important and he does not agree with Dr. Cohen that a *2mm* distance is necessary. He regulates the distance by the conditions, saving as much tarsus as possible, and also beveling the incision so that there is more tarsus on the skin side than on the conjunctival.

The forceps shown by Dr. Claiborne has the same disadvantage as the ordinary Desmarres or ring lid clamp, in that its two arms interfere. One of the great points in favor of Dr. Tenner's forceps is that there is no such interference, but on the contrary the operator has a free and open field. The omission of mention of Dr. Claiborne's instrument in the body of Dr. Tenner's article was not intentional, he stated, but an oversight.

Dr. Tenner claims no originality for the method of anæsthesia except as applied to this operation. The ballooning of the conjunctiva, to which Dr. Guttman stated he called attention twenty years ago for its anæsthetic effect, is important in Dr. Tenner's method of tarsal resection, not so much for its anæsthetic effect as for producing dissection of the conjunctiva, lifting it away without any cutting, thus preventing postoperative adhesions.

Dr. M. Uribe Troncoso (**the physiology of Schlemm's canal**) referred to the important researches made to ascertain the physiological nature of the angle of the anterior chamber, and especially of Schlemm's canal.

The prevalent view to-day following Leber's teaching is to consider the canal as a closed venous sinus similar in nature to the sinuses of the dura mater. However, Schwalbe considered it a lymphatic vessel as far back as 1869, but after a protracted discussion in which many observers took part, he relinquished his views in favor of the venous nature of the canal.

In a paper published in 1909, Dr. Uribe Troncoso claimed, as a result of his experiments on the filtration of fluids out of the eye, that the Schlemm canal was a lymphatic vessel. In a second paper in 1914, this view was supported with new physiological researches.

The anatomy of the angle and especially its vascular supply and the connections of the Schlemm canal with the venous plexus were studied in an important monograph by L. Maggiore of Rome, in 1917. He described a new intrascleral venous plexus near the edge of the cornea and settled the question of the shape and caliber of the small tubes connecting the canal with the venous branches. These he calls "collectors" and considered them as mere fissures between the scleral fibers, formed only by an endothelial lining and with virtual lumen. Being inserted obliquely to the canal, they really act as valves preventing the blood from the venous plexus entering the canal when the general blood pressure is normal. When this is increased the blood corpuscles can force the barrier made by the collectors and fill the canal. Schlemm's canal has not the structure of a vein, for there is no question of a proper wall, being only a closed plexus formed into spaces excavated in the sclera lined by endothelium.

Dr. Uribe Troncoso then described his own experiments, which consist in cutting and dissecting the conjunctiva around the limbus of a living rabbit, passing the anterior segment of the eye through a rubber dam membrane, and turning the animal on the side in such a position that the apex of the cornea is the lowest point of the eye. This is then immersed in a glass cup containing olive oil during a half or one hour's time. From the cut ends of the perikeratic venous plexus and the anterior ciliary veins, blood comes out at first, then coagulates, and a clear, transparent fluid leaks out, which can be collected and the amount of clot and serum compared with pure blood taken from the rabbit's ear; the rest being pure lymph.

As all the venous branches inside the sclera are either directly or indirectly in connection with Schlemm's canal, if clear lymph leaks from their cut ends instead of blood, the canal itself must contain lymph; in the same way that if a faucet is opened, or a pipe cut through, the liquid which fills the latter will come out. If the canal and episcleral veins should contain blood this will be found almost pure in the oil.

The best way to settle this physiological problem was, of course, direct observation of the canal; but this being concealed by the opaque edge of the sclera remained invisible.

In 1907 Trantas undertook the ophthalmoscopic examination of the irido-corneal angle, but to Saltzmann (1914–1915) belongs the credit for having perfected this method by the use of a contact glass placed on the cornea, making the accurate observation of normal eyes easy.

Saltzmann after numerous examinations declared the canal to be filled with a clear liquid and not with blood, as Leber had asserted. It is only in strong hyperæmia of the anterior segment or in pathological conditions that the author was able to see a reddish ring around the sclera. Even then the color was not indicative of pure blood, but only of a diluted liquid.

This year Koeppe, of Halle, using the Nernst-Gullstrand slit lamp and a new Zeiss stereoscopic instrument called "Bitumi" for indirect and "Ortobitumi" for direct examination, was able to see the angle with high magnifications in normal and pathological eyes. He also found the Schlemm canal to contain a clear liquid.

These demonstrations settle, according to Uribe Troncoso, the physiological problem, and henceforth Schlemm's canal must be considered as a lympathic plexus containing almost pure aqueous humor.

Dr. W. McLean: The subject of the physiology of Schlemm's canal is indeed a very important one, and as the essayist has said, it has been the prolific source of many interesting researches and still more divergent opinions, and to the present day there is still much to be learned of this important structure.

Ophthalmology owes Dr. Troncoso a debt of gratitude for his efforts to clarify our knowledge of this angle by his researches. Why is ophthalmology so interested in this little structure, the so-called angle of filtration? It is because it is believed to have bearing on the production of glaucoma.

The particular part of the physiology of Schlemm's canal considered in this paper is whether this canal is to be considered as a venous or a lymphatic channel. To arrive at a correct solution of this question we should first answer the questions: What is a venous channel, and what is a lymphatic channel, and what is lymph? Kirke's physiology defines lymph as "an alkaline fluid with a sp. gr. of about 1015. It is like blood plasma in composition, only diluted so far as its proteid constituents are concerned. The proteids present are fibrinogen, serum globulin, and serum albumen and the salts are the same and present in the same amounts as in the blood plasma, etc." In other words it is blood minus the corpuscles.

Physiology and chemistry have taught us that the aqueous fluid is a modified lymph. It seems to have been settled beyond dispute that the aqueous, at least in part, passes from the anterior chamber by way of spaces in the pectinate ligament, the spaces of Fontana, and that those spaces communicate with the canal of Schlemm. Anatomically the canal of Schlemm is similar to lymphatic channels, that is it does not contain a definite wall structure, but is merely a space or spaces within the scleral ring lined by a single layer of endothelial cells. Thus it would appear that the canal of Schlemm is a lymphatic channel because anatomically it is similar in structure to the lymphatics, and physiologically its lumen seems to be filled with fluid derived from the anterior chamber which we generally consider to be a lymph fluid.

On the other hand Thomson Henderson makes the statement in one of his writings on this subject that in examination of between two thousand and three thousand microscopical slides of serial sections of this structure of the eye every perforating anterior vein or its branches connects with the canal of Schlemm either by an afferent or efferent vessel, and some of these veins have both afferent and efferent connections to the canal of Schlemm. It is considered that either on account of the small caliber of these afferent and efferent vessels, or on account of the presence of valves, in the normal physiological state blood corpuscles are prevented from passing from the veins to Schlemm's canal, because it is only in pathological conditions that one finds blood corpuscles, at least to any considerable amount, in this canal.

The question is then shall we consider Schlemm's canal a venous or a lymphatic channel? If we consider it from the standpoint of what it contains, then it will be called lymphatic, but if considered from the standpoint of its connections then it would appear to be classed as a venous channel. Thomson Henderson classes it as a venous channel.

It is not quite clear in my mind just where and how deep the author makes incisions in connection with his experiment on the eye of the rabbit, and I do not understand why, if incisions are made in the sclera in the region of Schlemm's canal, no blood transudes, as with the microscope one is able to see veins in this region which are filled with blood corpuscles. The only explanation for the absence of corpuscles from these cut surfaces is that Dr. Troncoso first wipes away all bleeding and clots and after the bleeding stops adjusts a rubber tissue to hold back any conjunctival hemorrhage. After this is accomplished the eye is let into an oily solution and the filtration or transudation of the lymph observed. Is not the time consumed in the preparation of the rabbit for the rubber dam sufficient to stop the flow of corpuscles the same as occurs in an ordinary bleeding, and then by immersing the cut surfaces in the oil the complete sealing of the flow is prevented and thus the lymph transudes from the cut surfaces. A condition very similar to this occurs in small skin incisions, and by gently wiping away the fibrinous clot formed from the lymph of the blood an oozing of a clear liquid can be observed for a considerable time.

I would suggest that the author to verify his experiment denude a portion of the rabbit's ear and after the initial bleeding has ceased that denuded surface be immersed in oil and note if a transuding of fluid occurs, and if so wherein does this differ from the fluid collected from the denuded surface of the eye.

The essayist refers to the observations of Koeppe with the binocular microscope and the illumination by the Nernst slit lamp and says that these observations confirm the lymphatic theory. This method of studying the microscopical anatomy and following the functions of the eye is very interesting and has already opened new avenues for study and thought. There are some interesting writings by Koeppe, Voght, Gallemaerts, and Kleefeld showing progress made with this method of observation. I have made use of this method to some extent but unfortunately I do not possess an illuminating apparatus equal to the Nernst slit lamp, so my observations to the present time are not entirely satisfactory. I have tried to get a Nernst lamp but do not know of any to be had at present in this country. In the observations I have made of this angle by using this method I have been unable to note any coloration in the region of Schlemm's canal, but as I have said my illuminating apparatus is not yet perfect.

Doctor Cohen requested information regarding Maggiore's experiments. 1. How many human eyes were examined microscopically? 2. What hardening solution was used in fixation? 3. If serial sections were studied in the human series.

CORRESPONDENCE.

FOREIGN PROTEIDS IN TREATMENT OF IRIDOCYCLITIS.

BOSTON, MASS., January 22, 1921.

EDITOR ARCHIVES OF OPHTHALMOLOGY.

DEAR SIR:

The paper of Drs. Wiener and Bonime in your January issue, on the treatment of a single case of sympathetic uveitis with foreign proteins, prompts me to give a brief account of my own experience with this method of treatment. I desire first, however, to express my opinion that the case they report was in all probability not one of sympathetic uveitis. The patient had repeated attacks of iridocyclitis in the left eye for six years before the right eye became affected. None of these attacks could have been of the nature of sympathetic inflammation, otherwise the right eye necessarily must have been simultaneously affected, judging by what we know of this disease. It is inconceivable to me also that the left eye could have vision of $\frac{20}{50}$ after being subjected to repeated attacks of sympathogenic inflammation for ten years. Even if it is admitted that the case was one of sympathetic uveitis, it would have been such an extremely unusual one that it would be unsafe to draw any conclusions from it in regard to the treatment of sympathetic uveitis in general.

I have now employed non-specific foreign protein treatment of various eye diseases for over seven years. The idea was suggested to me by a statement made by Dr. Herbert Harlan in a discussion on interstitial keratitis before the American Ophthalmological Society in 1913. He stated that he had observed a number of cases of this disease in which an intercurrent attack of measles had produced remarkably beneficial effects. It immediately occurred to me that these beneficial effects were in all probability not due to any specific reaction, but to a general systemic reaction which enhanced all the factors of immunity in the body. I therefore endeavored at once to treat cases along this line. I first tried injections of mallein, but found that too great a quantity was required to produce a reaction. I then decided to try ordinary bacterial toxins, and finding that the most readily available were Coley's toxins, used for the treatment of sarcoma, I made use of these. In the beginning, I treated only cases of interstitial keratitis in this way. In all cases I gave subcutaneous injections sufficient repeatedly to raise the temperature, produce marked leucocytosis, and give local reactions at the sites of injection. In one case I obtained a febrile reaction of 105°, and in another a leucocytosis of fifty-two thousand. Most of the cases seemed to improve on this treatment, but after employing it in all such cases for two years, I concluded that the ultimate results were little if any better than those formerly obtained without it, and that the pain and discomfort were too great to justify its continuance, at least as routine treatment. In the meantime, I had begun to employ it in the treatment of cases of chronic iridocyclitis, and still continue to do so. In some of these cases, in which other treatment has failed, marked improvement has followed its use. I have also employed it in a few cases of chronic anterior intraocular tuberculosis. In these I have found that it would sometimes produce a focal reaction in the eye followed by improvement, just as after the use of tuberculin. These cases, however, were no doubt such as would have ultimately done as well without this treatment. For severe cases of intraocular tuberculosis I have not dared to use it, fearing it might do harm, and feeling sure that it would be of no more benefit than tuberculin treatment, which means, in my opinion, that it would be of no benefit at all.

In the treatment of sympathetic uveitis I began to employ this method of treatment in 1915, and altogether have used it in seven cases. Clinically these were all typical cases, and in four of them I had opportunity to examine the exciting eye microscopically and thus make the diagnosis certain. Three cases were of the serous type, and in each of these normal vision was obtained. Such cases, however, generally do well anyway.

A case that was moderately severe, vision being reduced to the counting of fingers, ultimately, after two prolonged courses of treatment, obtained vision of $\frac{20}{200}$. The other three cases were very severe from the outset. One did not respond at all to the treatment, another improved temporarily but the eye also ultimately became blind. The remaining case, in which the uveitis began about six weeks after cataract extraction, is still under my observation. The exciting eye was not removed because it had vision of $\frac{20}{15}$ at the onset. Both eyes have been more or less active for almost two years, with marked acute exacerbations and great pain. The first course of treatment with Coley's toxins, lasting two months, was begun two weeks after the onset, the diagnosis at first being somewhat uncertain. This seemed to be of considerable benefit, but a violent relapse soon occurred and a second course of treatment lasting six weeks was given which again seemed to be of benefit. A temperature of over 103° and leucocytosis of twenty-two thousand were obtained several times. Since then frequent relapses have occurred and both eyes are soft and practically blind.

In all of these cases of sympathetic uveitis treatment with large doses of salicylates intermitted with mercurial inunctions was employed in addition to the Coley's toxins. In the last case, six injections of neosalvarsan were recently given, without benefit. In the severe case which did not respond at all to Coley's toxins, injections of typhoid vaccines were employed about a year ago also without beneficial results.

Since in all these cases Coley's toxins produced marked febrile reactions, leucocytosis, and local reactions at the sites of injection, there is no good reason to believe that any other non-specific foreign protein would have given better results. It seems to me that if in any chronic disease, a course of such treatment, lasting about six weeks, does not eradicate the causative factor, it is hopeless to expect any permanent benefit, for the effects of the injections, compared to the chronicity of the disease, are, of course, relatively temporary.

The treatment in no case produced any serious untoward effects, although in one patient it produced a marked exudative dermatitis. Judging by my experience, therefore, treatment of sympathetic uveitis by injections of foreign proteins is of very doubtful value and certainly cannot be regarded as a radical cure for the disease. In the treatment of certain forms of iridocyclitis, however, such injections seem to be of considerable value but should not be used to the exclusion of other forms of treatment, including especially the removal of any discoverable foci of infection. Possibly in some cases Coley's toxins may have a specific effect, since probably many cases of iridocyclitis are due to streptococcus infections.

Very truly yours,
F. H. VERHOEFF.

NOTICES.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

President: J. HERBERT FISHER, F.R.C.S.

ANNUAL CONGRESS, 1921.

The next Annual Congress of the Society will be held on Thursday, Friday, and Saturday, 5th, 6th, and 7th of May, 1921, at the **Royal Society of Medicine, 1, Wimpole Street, W. I.**

The arrangements will be as follows:

THURSDAY, MAY 5th.

Morning.

10 A.M. to 12.30 P.M. ... **President's Opening Address.**
Papers:—Mr. Maitland Ramsay: "A Case of Cyclitis Associated with Swelling of the Parotid Glands."

Afternoon.

2.15 P.M. ... ... Discussion on "The Psychology of Vision in Health and Disease." To be opened by Prof. C. Spearman, F.R.S., and Sir F. W. Mott, K.B.E. The following also intend to speak: Mr. J. H. Parsons, C.B.E., and Sir Robert Armstrong-Jones, M.D.

Afternoon.

5 P.M. ... ... Bowman Lecture by Mr. E. Treacher Collins: "Changes in the Visual Organs Correlated with the Adoption of Arboreal Life and the Assumption of the Erect Posture."

Members will dine together in the evening.

FRIDAY, MAY 6th.

Morning.

10 A.M. ... ... Discussion on "The Treatment of Manifest Concomitant Strabismus." To be opened by Mr. C. Worth and Mr. A. J. Ballantyne. The following also intend to speak: Mr. E. E. Maddox and Sir Arnold Lawson.

Afternoon.

2.30 P.M. ... ... **Visit to St. Thomas's Hospital, Westminster Bridge.**

Clinical Meeting. Members are invited to show cases of interest. The Hospital will be open for inspection, and the Medical Staff will contribute exhibits.

Evening.

8.30 P.M. ... ... Papers:—Lieut.-Col. H. Herbert: "Results of the Iris-prolapse Operation for Glaucoma."

SATURDAY, MAY 7th.

MORNING.

10 A.M. ... ... Business Meeting.
Papers.

The optophone will be demonstrated in the Bowman Library during the Congress.

Members desirous of reading Papers, showing Cases, or taking part in the Discussions, are requested to communicate as soon as possible with Mr. F. A. JULER, 14, Portland Place, London, W. I.

Papers and Communications, subject to the judgment of the Council, will be printed in full in the *Transactions*.

Under the Bye-laws readers of Papers must not exceed twenty minutes, subsequent speakers ten minutes. The openers of the Discussions are allowed twenty minutes.

All Communications must be typewritten.

R. R. JAMES } *Hon. Secs.*
F. A. JULER }

OXFORD OPHTHALMOLOGICAL CONGRESS.

Master, SYDNEY STEPHENSON.
Deputy Master, PHILIP H. ADAMS.
Hon. Treasurer, SIR ANDERSON CRITCHETT, BART., K.C.V.O.
Hon. Secretary, BERNARD CRIDLAND, Salisbury House, Wolverhampton.
Past Master, THE LATE ROBERT W. DOYNE.

February, 1921.

PRELIMINARY NOTICE.

The Oxford Ophthalmological Congress will assemble at Keble College, Oxford, on the evening of **Wednesday, July 6th** next, and the Meeting will be held on **Thursday, July 7th,** and **Friday, July 8th,** with an extension to the morning of **Saturday, July 9th,** should the program of the proceedings demand it.

On Thursday, July 7th, a discussion on "THE CAUSES OF INFECTION AFTER EXTRACTION OF SENILE CATARACT" will take place, to be opened by Dr. Victor Morax, of Paris.

Members intending to take part in the Discussion are requested to kindly send in their names to the Hon. Secretary at their early convenience.

The Doyne Memorial Lecture will be delivered on the morning of Friday, July 8th, by Ernest E. Maddox, Esquire, M.D., F.R.C.S.E., the subject being "HETEROPHORIA."

The Official Dinner of the Congress will take place on the evening of Thursday the 7th, in the Hall of Keble College.

A General Meeting will be held during the Congress at a time of which due notice will be given in the final program.

It is hoped that members will contribute to the success of the Meeting with papers, pathological specimens, new operations, cases, or novelties of any kind.

Notification of such at the earliest opportunity to the undersigned will be appreciated.

BERNARD CRIDLAND,
Hon. Secretary.

Salisbury House,
Wolverhampton.

MEETING OF THE VIENNA OPHTHALMOLOGICAL SOCIETY, AUGUST 4 TO 6, 1921.

As there will be no meeting of the German Ophthalmological Society in Heidelberg this year, the *Vienna Ophthalmological Society* has decided to hold an extraordinary meeting in Vienna on August 4th to 6th.

"*The efficacy of the new operations for the relief of glaucoma, compared with the classical iridectomy of von Graefe,*" will be the subject for the first day of the congress, Thursday, August 4th, at 9 A.M. The introductory addresses on the clinical aspect will be given by Professor Uhthoff and on the theoretical and anatomical aspects by Professor Wessely.

The titles of papers and demonstrations are to be sent in not later than June 15th to the secretary, Dr. H. Lauber, Vienna VIII, Alserstrasse 25. The time limit for a paper is fifteen minutes, for a demonstration five minutes. It is understood that no papers are to be presented which have previously been published. The papers and remarks, together with simple illustrations, are to be handed to the secretary before the close of the session.

The dues for those who are not Austrian members will be twenty marks, which is to be sent to Rheinische Kreditbank Filiale Heidelberg, unter Konto Prof. Dr. J. Meller. The transactions of the meeting will be sent to the members by the publishers at a reduction of 20%. It is very important that those who will attend shall signify their intention to Dr. R. Kramer, Vienna VIII, Kochgasse 25, who will look after suitable lodgings.

(Signed) PROF. DR. J. MELLER.

Professor Fuchs, who is at present in Barcelona, writes that colleagues from the recently belligerent countries, particularly Americans, are cordially invited.

VOL. L. No. 3.

ARCHIVES OF OPHTHALMOLOGY.

CONCERNING THE OCULAR SYMPTOMS IN THE SUBJECTS OF HYPOPHYSEAL DISEASE WITH ACQUIRED SYPHILIS; WITH ILLUSTRATIVE CASES.[1]

BY G. E. DE SCHWEINITZ, M.D., PHILADELPHIA, PA.

(*With five illustrations on Text-Plate X.*)

IT is well known that luetic disease of the hypophysis has been observed, not infrequently, in the subjects of hereditary syphilis, that is, an interstitial inflammation of the gland with necrotic lesions.[2] Hypophysary infantalism, or dystrophia adiposa genitalis, with this relationship has been described by a number of authors, for example, by Langmead, Lereboullet, Mouson, and Castex,[3] and Nonne[4] has recorded a cure of this condition on the basis of hereditary lues. I have recently examined (examinations not yet completed) two patients, a girl of twelve and a young man of twenty, of the dystrophia adiposa genitalis type, referred by Dr. W. G. Spiller, who are probably congenitally luetic, and have in addition pigmentary degeneration of the retinas. Such types of pituitary body disease will not be discussed in the present communication.

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[1] Paper read before the Ophthalmic Section of the Academy of Medicine of New York, December 20, 1920.

[2] Consult *Syphilis und Auge*, by Joseph Igersheimer, Berlin, 1918, and Henschen and Nager, *Correspondenzblatt f. Schweizer Aertze*, XLIX. Jahrgang, 1919, No. 36.

[3] Consult *Revue de Neurologie*, vol. xxiv., p. 493, 1917; *Proceedings of the Royal Society of Medicine*, X. Sec., "Diseases of Children," p. 25, 1916–1917; *Semana med. Buenos Aires*, 1919, xxvi., p. 2, 404.

[4] *Deutsch. med. Wochenschrift*, 1918, xliv., p. 536.

With acquired lues primary syphilis of the gland is comparatively uncommon (Simmonds, quoted by Igersheimer, finding among 1700 hypophyses, microscopically examined, only nine with syphilitic changes), but the gland may be secondarily involved from bony or dural syphilis; in these circumstances cheesy degeneration, thickening of the capsule, endarteritis, etc., have been noted. Henschen and Nager refer to only one case of acromegaly from this type of pituitary body disease. Cushing,[1] reports one case of gumma of the hypophysis with glycosuria and polyuria.

The paper I have the pleasure of presenting this evening, however, concerns itself, from the clinical aspect only, with some observations on the ocular symptoms in patients with acquired syphilis who also had lesions, although not in all instances necessarily syphilitic lesions, of the hypophysis. Except incidentally, it does not concern itself with a discussion of the subject from the pathological standpoint, nor shall I consume further time with an analysis of the literature. The material may be arranged as follows:

1. Hypophyseal disease in the subjects of acquired syphilis, but the pituitary body lesion not necessarily, and probably not, itself syphilitic.

2. Hypophyseal disease in the subjects of acquired syphilis and the pituitary body lesion definitely, or in all probability, syphilitic.

3. Hypophyseal disease in subjects in whom the history and sorological tests did not demonstrate syphilis, but in whom the favorable result of anti-luetic treatment, combined with pituitary body and thyroid gland feeding, was suggestive.

In illustration of the first subdivision, I summarize the following case history:

Case 1.—A man, aged 49, reported for examination June 2, 1920, on the recommendation of Dr. A. O. Pfingst.

History of Present Illness.—On April 1, 1920, the patient consulted Dr. Pfingst because he had noticed (patient's statement) that for a year "his right eye was slowly becoming weaker than his left eye," and that at or about the time of this consultation he had been troubled occasionally, while walking on the street, with diplopia which, he believed, was present in all portions of his visual field.

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[1] *The Pituitary Body and its Disorders*, 1912, p. 263.

Tested by Dr. Pfingst, vision through correcting lenses was $\frac{20}{XX}$ with each eye; there was no manifest strabismus, but an "esophoria 16 degrees and 4 degrees of vertical deviation." Except for patches of superficial retino-choroiditis (presently to be more particularly described), no abnormalities of the eyegrounds were to be observed.

A Wassermann test made at this time is said to have been negative. The patient was referred for general examination, and the laboratory reported a +1 Wassermann of the blood, and on April 20th specific treatment was begun.

Two weeks later (May 5, 1920) he was again examined by Dr. Pfingst, and the following ocular conditions noted: Slight exophthalmos, marked convergent squint of the right eye, and vision reduced to the ability to count fingers at 12 feet. No new fundus changes were observed, and the perimetric examination "showed nothing typical." Previous visual field tests (April 12th) had demonstrated decided fluctuation—first a normal field for white, but red and green circles constricted; one week later a standard size of visual fields for white and colored objects.

X-ray examination of the paranasal sinuses was negative but indicated marked changes in the region of the sella turcica.

Additional data are as follows: For a year the patient has had headache, on an average once a week, and for the past two months intermitting sharp pain in his forehead and behind his right eye, which has recurred with increasing frequency and severity, although only once so violent as to wake him at night. Gastro-intestinal, pulmonary, cardiac, and renal symptoms have not been in evidence. He was admitted to the University Hospital on June 2, 1920, where the following additional history was obtained:

Previous Medical History.—The patient has experienced the usual diseases of childhood, but has had no serious infections. He has had three attacks of tonsillitis and laryngitis. He denied gonorrhœa and syphilis, and gave no history of an injury to the skull. There has been no sudden accumulation of fat; loss of sexual power has been noted.

Social History.—The patient is a business man, and his work is unconnected with any special effort or strain. He does not use alcohol, smokes moderately, drinks neither tea nor coffee, and takes a fair amount of exercise.

Family History.—There are no facts of importance in his family history of his parents. The patient has been twice married. His first wife was for a long time an invalid, and had both ovaries removed. For eight years prior to her death he was not able to test his sexual power, but when he married his second wife he discovered that he was sexually impotent.

Physical Examination.—The patient is an adipose young-looking man, appearing far younger than his forty-nine years would justify. The bony framework exhibits no deformity. His musculature is flabby, the panniculus adiposis excessive, especially through the abdomen. The deep reflexes, sense of position, stereognosis and diadokokinesis were normal; no Romberg sign or Babinski's reflex; hair of the head normal; no sinus tenderness. The nares, teeth, and ears were normal; functions of the fifth and seventh nerves undisturbed; neck negative; chest (barrel-shaped), except for a limited degree of expansion, normal; heart sounds regular in rhythm and rate. The pendulous abdomen gave no indication of tenderness nor rigidity; viscera not enlarged. The distribution of the pubic hair suggests that of the female; extremities negative. Urine examination was negative; there was no polyuria; blood count normal.

Lumbar puncture: Pressure 8*mm* Hg.; withdrawal 4*cc;* Wassermann negative; globular positive; blood Wassermann negative (patient had been under specific treatment for two months).

X-ray Examination.—Dr. Henry Pancoast reports: "The roentgenogram shows an enormous enlargement of the sella turcica, with disappearance of the posterior clinoid processes and almost complete encroachment upon the sphenoid sinuses. Although it is difficult to decide definitely whether this appearance is due to a pituitary body or an extrasellar growth, the marked encroachment on the sphenoid sinuses and the absence of other indications of intracranial pressure suggest that it depends upon an hypophyseal tumor.

Ocular Examinations.—The ocular examinations made prior to the patient's coming under my care have been summarized (See *History of Present Illness*). On June 2, 1920, they yielded the following results: Vision of right eye counting fingers at 30*cm;* of left eye $\frac{6}{7.5}$. The pupils responded to the usual stimuli, but the direct light response of the right pupil was less in degree than that of the left; Wernecke's symptom was not demonstrable. There was practically complete paralysis of the right external rectus, with convergent squint and almost entire loss of the outward rotation; no other exterior muscle involved. Exophthalmos was present, Hertel's instrument recording 16*mm* in right; 13*mm* in left.

The right optic disk was markedly gray in its deeper layers;

slight diminution in the size of the retinal arteries. Between the disk and the macula there was a large, somewhat irregular area of superficial retino-choroiditis, characterized by a mottled condition, due to fine pigment changes and small erosions evidently in the choroid, giving rise to the so-called "moth-eaten appearance"; no hemorrhages; no pigment heaping. Directly in the macula fine changes existed, similar in character, but less produced, than those in the larger area. The left optic disk had a normal color superficially, but was slightly grayer than normal in its deeper layers; no vessel alterations. Occupying almost exactly the position it had in the right eye, and of identical appearance, although of smaller size, was a patch of retino-choroiditis; fine changes were present in the macula.

The visual field maps showed, *right* slight narrowing of the white field, with a tendency to a temporal slant, complete color temporal hemianopsia and a large, temporal hemianopic absolute scotoma; *left* slight concentric contraction, with a tendency to temporal slant, contraction of the color lines and decided temporal slant, with almost complete loss of temporal green field and slight enlargement of the blind spot (McHardy's perimeter, 10*mm* test objects, daylight). (Fig. 1.) Examinations repeated with campimeter and small test object (5 and 3 *mm* size) revealed practically complete temporal hemianopsia for colors. These examinations were repeated a number of times during the next few days without material alterations.

Operation.—Sellar decompression (first stage) was performed by Dr. Charles Frazier on June 15, 1920, and a pulsating membrane was exposed from which clear fluid exuded. At the time there was some uncertainty whether this represented the wall of a pituitary body cyst, or whether the subarachnoid space had been opened. Evidently, according to the good results which followed, this must have been a cyst.

Five days after operation improvement was noticeable: temporal color field of right eye restored, although the concentric contraction of the white field was greater than prior to the operation. Fifteen days after operation, when the last test was made just before the patient returned to his home, the visual conditions were as follows: Vision of R.E. $\frac{6}{150}$, with the head turned toward the right shoulder; corrected vision of the left eye $\frac{6}{6}$—. The fields (McHardy perimeter, 10*mm* object) were: Right eye: No change in the hemiopic scotoma, restoration of the temporal blue field; a patch of red perception in the temporal area, but not a complete restoration of that field; marked widening of the white circle; left eye: widening of the white field, with moderate temporal slant; color hemianopsia disappeared. These results were also confirmed by campimeter observations. The palsy of the right external rectus had almost disappeared (outward rotation 40 degrees), and the exophthalmos had lessened.

The last record of an eye examination was made by Dr. Pfingst and reported on November 9, 1920, or practically five months after operation, and during this period the patient had been given pituitary body extract and also specific treatment. Vision on this date was R. E. counting fingers at 1 foot in the nasal field; field of vision not reported except "accurate results were not possible." Vision of left eye $\frac{20}{\mathrm{xx}-}$, therefore exactly as it had been fifteen days after operation; visual field concentrically contracted, but no hemianopsia. Complete restoration of the function of the right external rectus; disappearance of the exophthalmos.

The general condition is reported as good, with the exception of sexual apathy, which remains unchanged.[1]

Comment.—Evidently, if it is conceded that this patient had syphilis, the gland lesion of itself was not syphilitic.

Although the symmetric patches of retino-choroiditis do not present appearances characteristic of lues, in the sense, for example, in which chorioretinitis of the Jacobson-Foerster type, or central recurring retinitis is, I have observed several similar lesions in syphilitics, where other ætiologic factors were excluded, and such lesions may, at least, be regarded as suggestive.

The external rectus palsy did not lessen during two months of specific treatment, and was probably not due to a syphilitic affection of the abducens; it lessened almost immediately after operation, and had practically disappeared, together with the exophthalmos, in two weeks. Doubtless these manifestations were due to pressure exercised in the neighborhood of the right posterior clinoid process and the cavernous sinus.

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[1] After the above account was written, the patient returned (February 7, 1921), with a complete recurrence of symptoms noted at first examination. The improvement (he had been constantly under specific treatment and had taken pituitary extract), therefore, lasted only about six months. Operation by Dr. Frazier, February 17, 1921; patient did not survive. Autopsy showed a large extrasellar growth (sarcoma) with extrasellar extension; a large vessel penetrating growth was infiltrated with tumor tissue.

In illustration of the second subdivision, I summarize the following case history, the presence of acquired constitutional syphilis being definitely established.

CASE 2.—A man, aged 45, reported for examination December 9, 1919.

History of Present Illness.—Two years prior to admission to the University Hospital (December 22, 1919) he first noted diplopia and some "weakness of vision." This diplopia was manifest in all portions of the field except directly forward. It lasted for about four weeks, but apparently as the result of treatment (which he declared was "local," probably an inaccurate statement) disappeared. There was no return of double vision (and also no treatment except for a few weeks) until August, 1919, when the "attack" recurred, even more insistently than on the first occasion. Diplopia was present in all parts of the field, and was not dissipated by treatment. He states that at this time he had one intravenous injection of salvarsan, but apparently no additional medication.

The patient has not suffered from headache, has not lost weight, in fact, there has been a gain of about five pounds. He has lost some of the body hair, especially from the chest and axillæ, and his sexual power has been somewhat lessened, but he is not entirely impotent.

His appetite has remained good; indigestion and constipation have not been in evidence. Symptoms indicative of cardiac or pulmonary distress have not been present. Nocturia has existed for approximately one year.

His disposition has changed materially. Normally a rather "gay person," he has become "quiet and lacks the energy of younger years, has frequent weak spells and loss of buoyancy," but he has not grown nervous, and sleeps well.

Previous Medical History.—The patient has had the usual diseases of childhood; mumps twenty and typhoid fever twelve years ago. He has had three attacks of gonorrhœa, the last attack having occurred in 1907. In 1904 a "sore," described as having the characteristics of an "ulcerated patch," rather than those of a hard chancre developed on the foreskin.

Social and Family History.—The patient, an unmarried white man, has used whisky steadily for fifteen years; he smokes moderately, but has not drunk tea or coffee to excess. The members of his family are all healthy, and there are no facts of importance in their history.

Physical Examination.—The patient is well nourished, presents no abnormality in posture, gait, or station; his mentality is clear. The skin is warm and of a peculiar velvety smoothness. There is a noticeable layer of subcutaneous fat, very little hair on the axillæ, and some diminution of pubic hair. The neck (except slight cervical adenopathy), chest, and abdomen are negative, and the genitalia without abnormalities. The knee and ankle jerks are normal; no clonus; no Babinski sign. Nocturia has been noticeable for a year.

Except for a trace of albumin and an excess of triple and amorphous phosphates, the urine is normal. The blood count was as follows. R.b.c. 5,500,000; w.b.c. 7500; H.b. 90%; poly. 30; lym. 58; trans. 4.

Basal metabolism: Total calories per sq. meter of body surface = 33.6%. Percentage below normal = −11%.

Blood sugar test results:

Blood sugar	before	ingestion of sugar	0.11%
" "	1 hr. after	" " "	1.14%
" "	2 " "	" " "	0.13%
" "	3 " "	" " "	0.12%
Urine	2 " "	" " "	neg.
"	3 " "	" " "	neg.

The blood Wassermann test was strongly positive, +4 with three antigens.

X-ray examination revealed a large pituitary body growth, with disappearance of the posterior clinoid processes, and 40 per cent. encroachment of the sphenoid sinuses.

Ocular Examination (12.9.19).—Vision of the right eye, with −0.75 s. $\bigcirc$ −1.00 c. axis 100, $\frac{6}{6}$ −; of the left eye with −1.25 c. axis 75, $\frac{6}{12}$. The pupils were slightly unequal, right 3.5*mm*, left 4*mm*, the right being oval in shape; response to the usual stimuli was prompt and normal; no nystagmus.

There was paralysis of the right external rectus, convergent strabismus of that eye and corresponding diplopia. Rotation outward not entirely lost, but markedly limited, no more than 5 degrees. No other type of diplopia was present, and all other rotations were normal. There was no exophthalmos.

The right optic disk contained a large physiologic cup, was of good color, its upper edge being veiled by retinal streaks. The vessels carried normally tinted blood; the arteries were tortuous; there were no retinal or choroidal changes. The left optic disk also contained a large physiologic cup, and it and the fundus generally corresponded in all particulars to those of the opposite eye.

The right visual field for white was contracted and sloped on the temporal side; the color fields were contracted, and there was a complete upper temporal quadrant color anopsia. The left visual field showed a complete temporal color hemianopsia and a partial temporal hemianopsia for white, part of the lower and outer field being preserved. Two days later similar fields were obtained, with the hemianopsia for white less marked. No scotomas were found in any of the field examinations (McHardy perimeter, 10*mm* objects, and campimeter 3 and 5*mm* objects). Many fields were charted, and exhibited the fluctuations not uncommonly found in pituitary body disease, but on the whole not varying in any important degree from those which are shown.

The patient was admitted to the University Hospital (December 22, 1919), and Dr. Frazier called in consultation. It was determined to try the effect of specific treatment. Between December 23, 1919, and January 23, 1920, Dr. B. A. Thomas administered 6 intravenous injections of neoarsphenamine, the initial dose being .75 grm. and the others .9 grm.; in the intervals iodids and bichlorid were exhibited.

The response was prompt and satisfactory. At the expiration of seventeen days the abducens palsy had almost disappeared (esophoria 8), and eight days later there was no diplopia, and with the rod, orthophoria. Corrected vision O.D. was $\frac{6}{6}$ −, O.S. $\frac{6}{6}$ −. The field for white of the right eye had regained almost the standard limits, and the color quadrant hemianopsia had disappeared; in the left field, temporal side, practically only an upper and outer quadrant remained dark. The patient was discharged on January 30, 1920, the blood Wassermann being now negative, and earnestly requested to keep up systematic treatment in his home under medical advice. On February 13 1920, he wrote, "my eyes are daily improving." (Fig. 4.)

Apparently treatment was not continued, or else in a most indifferent manner. He returned April 19, 1920, with a sharp relapse, tension being R.E. $\frac{6}{30}$, L.E. $\frac{6}{9}$; renewal of the quadrant color hemianopsia of the right field, and a marked temporal color defect in the left, the white defect being about as it had been on the day of his discharge; diplopia again present and the right externus paretic. (Fig. 5.) Neoarsphenamine injections (three) were administered, with prompt response. The patient, however, did not remain for any length of time, *i.e.*, not until there was complete disappearance of the symptoms of this relapse. He was sent to his home with full directions as to treatment, but has not reported since that date.

Comment.—This patient undoubtedly was the subject of acquired syphilis, and about fourteen years after the primary lesion, at which time treatment was of the most indifferent character, if, indeed, constitutional measures were at all employed, the first symptoms of pituitary body involvement were manifested.

The infrequency of primary syphilis of the hypophyseal gland has been noted; its secondary involvement as the result of bony or dural syphilis is more common. In the present instance the X-ray showed so marked an enlargement of the central hypophysis, and no suggestion of extra-sellar disease, that Dr. Frazier and I have listed the case as one of probable gumma of the pituitary body; this diagnosis is not inconsistent with the symptoms.

In contrast to the first case recorded, the abducens palsy yielded promptly to the neoarsphenamine and mixed treatment, and may be assumed to have been syphilitic in origin. The three relapses of this nerve paralysis when treatment was neglected, and the change in disposition, are not without significance in this regard.

Although external rectus palsy, associated with, or produced by, pituitary body disorders is uncommon (very unusual, Knapp), implication of the exterior ocular muscles (generally those supplied by the oculo-motor) is not especially infrequent, occurring in from 10 to 25 per cent. of the cases, according to Uhthoff's statistics, in 27 per cent. in de Lapersonne's and Cantonnet's list. I am unacquainted with any tabulation of syphilitic (not congenital) subjects with hypophyseal disease in an endeavor to show whether in them ocular muscle palsy is more frequent than it is in those who are not the subjects of acquired lues. In ordinary circumstances the third nerve is much more frequently involved in ocular syphilis than either the sixth or the fourth (the third 73 per cent.; the sixth 24 per cent.; the fourth 3 per cent. (Groenouw).

Among a rather large number of patients with pituitary body disease, personally investigated, five were the subjects of constitutional syphilis, but in only one was the gland lesion almost certainly luetic; one was probably syphilitic, but the gland lesion was not, or at least not definitely, specific; three, it is barely possible, may have been luetic, but this was not by any means definitely proven. Among these patients there were exterior ocular muscle palsies in three, twice palsy of the external rectus, and once complete left oculo-motor paralysis.

In illustration of the third subdivision, I summarize, very briefly, three case histories, elsewhere reported in detail,[1] although in general terms it may be questioned whether they are germane to the present topic, except that they furnish an excuse for some therapeutic speculations.

CASE A.—An unmarried white woman, aged 39, with tumor of the pituitary body, demonstrated by X-ray examinations, had complete bitemporal hemianopsia, ophthalmoscopic optic nerve atrophy (very pallid discs), left complete oculo-motor palsy, absolute blindness lasting twelve days in the right eye and six weeks in the left. Under the influence of large doses of thyroid extract, associated with inunctions of unguentum hydrargyrum, the vision of the right eye was completely restored and that of the left eye partly restored ($\frac{6}{9}$), and the hemianopsia, ocular palsy (except that of the ciliary muscle) entirely disappeared. Constitutional syphilis was not demonstrated, either by the history or by any method of examination. During a period lasting from June 1st to October 3d, the patient took 400 five-grain tablets of thyroid extract, and received 60 one-drachm inunctions of mercury; intermittently from August to October iodide of potassium was exhibited (exact dosage not known). During three weeks prior to beginning the thyroid feeding the patient had taken iodide of potash, protiodide of mercury, and received a few inunctions, but none of the remedies in large doses. For six months after the completion of the thyroid-mercury medication recorded above, the patient continued to take irregularly thyroid extract and to have mercury inunctions, but as she was not under my constant observation, I am unable to state accurately how much additional mercury and thyroid extract was administered. The final good result recorded was noted at the end of this period.

CASE B.—An unmarried white woman, aged 51, with tumor of the pituitary body, demonstrated by X-ray examination, had complete bitemporal hemianopsia (preceded by hemianopic scotomas and color hemianopsia), reduction of visual acuteness (O.D. $\frac{6}{60}$, O.S. $\frac{4}{100}$, lowest ebb), and ophthalmoscopic optic disc atrophy; no muscle palsies. During a period lasting from June 10, 1914 to December 10, 1914, she took 400 two and one half grain tablets of thyroid extract, and 200 two and one half grain tablets of pituitary body extract, and received 58 one-drachm inunctions of unguentum hydrargyrum. Vision of O.D. now $\frac{6}{7.5}$, but vision of O.S. reduced from $\frac{6}{12}$ at first examination to $\frac{4}{60}$. Thyroid-pituitary body extract was continued, but no more mercury given. From July, 1914, to February, 1917, she consumed 2100 tablets ($2\frac{1}{2}$ grains each) of thyroid extract and of pituitary body extract, because although vision was practically restored nearly two years before, if these medicines were discontinued, headache returned. No history of syphilis and none was demonstrated by laboratory tests.

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[1] *Pennsylvania Medical Journal*, April, 1912; ARCHIVES OF OPHTHALMOLOGY, vol. xliv., No. 2, 1917.

Case C.—An unmarried woman, aged 18, with tumor of the pituitary body, not absolutely demonstrated by X-ray examination, in that the report was "sella ill-defined and cloudy," with periods of diplopia for at least a year, moderate choking of each disk (2.5 D.), and when examined complete blindness of the right eye (lasting one week), and vision of left eye reduced to counting fingers in the temporal field, the nasal field being entirely dark, but the temporal field for *form* intact, at the expiration of 40 days of active medication, during which time she took 200 grains of thyroid extract, and received 30 one-drachm inunctions of mercury, had vision restored, — $\frac{6}{10}$ each eye, $\frac{6}{7.5}$ both eyes, the choked disks had disappeared, the surfaces of the disks being pale, and the visual fields normal. History and laboratory tests negative in so far as syphilis is concerned.

Comment.—The advantage of glandular feeding in pituitary body disease, where the stage of glandular insufficiency exists, need not be discussed, nor, because the pituitary body malady is a polyglandular one, to quote Cushing, the value of the administration of extracts of glands other than the one primarily involved. Hence the question arises whether the mercury used in large doses in the treatment of the patients mentioned in the summarized case histories was a necessary adjunct and a large contributor to the excellent results, and if it was, how did it act advantageously, and why? The subheading refers to the action as "suggestive," which must mean that all of these patients may have been luetic in spite of negative examination. Certainly it must be admitted that all of them showed a somewhat remarkable tolerance to mercury; also one non-positive Wassermann does not exclude syphilis. And yet in all other counts they were free from the suspicion of specific taint, and in the original reports the cure was attributed, certainly in largest measure, to the thyroid-extract pituitary body feeding.

A second suggestion, which has come into prominence in recent years, especially since thyroid extract has achieved success in the treatment of certain types of keratitis and uveitis, is that insufficiency of glandular secretion inhibits the action of remedies which possess a so-called antiphlogistic, or, in a sense, specific influence. This being eliminated by organotherapy, the inhibition is removed and the remedy is free to exercise its curative activity. That more or less antagonism exists between the processes of mercuralization and inflammation, at one time maintained, and not, I think, altogether abandoned, is well known. Should this be true, it might be asserted that this constituted the basis of the good effect of the mercury therapeusis, save only that primary inflammation of the pituitary body, if it occurs at all, must be very unusual (Adami).

As organotherapy alone in hypopituitarism has often proved successful, it may be asserted that the action of mercury as a curative agent in this regard was negative, but it is difficult to believe that its influence was negligible, considering the large amounts of the drug which were exhibited.

Finally, to leave the field of pure speculation, mercury undoubtedly stimulates in some particulars glandular activity —the salivary gland and the pancreas. Whether such influence is also exercised in the endocrine glands I do not know, but it may well happen that mercury and thyroid and pituitary body extract, simultaneously exhibited, develop a synergic action, each aiding the other in stimulating glandular secretion with advantage, therefore, in the stage of glandular insufficiency.

I venture to make the following suggestions, in spite of the limited experience on which the conclusions are based:

None of the ocular symptoms depending upon pituitary body disease is of itself characteristic of acquired syphilis, and these symptoms, therefore, do not differ from those exhibited by patients who are not syphilitic.

It is possible, even probable, that a careful analysis of cases of pituitary body disorders, with exterior ocular muscle palsies, would show a greater incidence of such paralyses in luetic subjects, especially in secondary involvements from bony or dural syphilis.

Naturally, if a patient with acquired syphilis develops the symptoms of hypophyseal disease, active specific treatment should, and would, be instituted.

If in such circumstances the gland itself is not either primarily or secondarily syphilitic, the ocular signs of pituitary body involvement would not yield, and surgical interference is indicated. If the gland is the seat of syphilis, being gummatous, for instance, a freely employed specific treatment may result in satisfactory and even brilliant results.

All patients, therefore, with pituitary body disorder, who also have constitutional syphilis, or from whom the suspicion of such an infection cannot be eliminated, should have the advantage of a full trial of this therapeutic test. The advantages of such measures in the treatment of the not infrequent involvements of the gland in the subjects of congenital syphilis, even in the presence of dystrophia adiposa genitalis is a matter of record (Nonne).

Ophthalmoscopic examination of the eyegrounds of patients with hypophyseal disorders should be thorough, including, after dilatation of the pupil, the periphery of the fundus. Discovery of patches of retino-choroiditis, centrally placed, are not readily overlooked but otherwise lesions especially in the far periphery may be overlooked; this is particularly true of congenital lues, where other stigmata of this disease may not be conspicuous.

In stages of glandular insufficiency the efficacy of organotherapy is probably enhanced by simultaneous administration of mercury (preferably by inunctions) and the gland extracts, even though the presence of syphilis is not demonstrable by the usual methods.

It is probable that a combination of thyroid and pituitary gland extracts is more efficient than either of the extracts alone, and that this combination, associated with mercury, is more effective than is an extract of one gland, even though given in conjunction with unguentum hydrargyrum.

THE CONTROL OF PITUITARY LESIONS, AS AFFECTING VISION, BY THE COMBINED SURGICAL-X-RAY-RADIUM TREATMENT.[1]

By CHARLES H. FRAZIER, M.D., D.Sc.
Surgeon to the University Hospital, Philadelphia.

(*With five illustrations on Text-Plates XI.–XII.*)

IN at least 90 per cent. of cases, the patient seeks relief at the hands of the surgeon because of failing vision. In the remaining 8 per cent., headache with or without failing vision is the symptom of which the patient seeks to be relieved. In the exceptional case there may be disturbances of pituitary function that are factors, such as adiposity, sexual apathy, amenorrhea. But in the vast majority of those who find their way to the Neurosurgical Clinic, the pressure phenomena, failing vision and headache, are the chief indications for surgical intervention.

It is surprising how late in the course of the disease the true nature of the lesion is revealed. Looking over my records I find when first consulted that 24 per cent. were totally blind and 21 per cent. practically blind in one eye. In other words, 45 per cent. or almost half, had already lost the sight of one eye. In 6.5 per cent. the patient was totally blind in both eyes or practically so.

Hemianopsia was of course the most constant ocular finding; in only 5 per cent. was there recorded a choked disk.

As visual disturbance is the principal offender and as this is a pressure phenomenon, the problem which confronts the surgeon primarily is one of relieving pressure upon the optic commisura or optic tracts. He must choose one of several procedures.

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[1] The substance of a discussion at the meeting of the Section on Ophthalmology, New York Academy of Medicine, December 20, 1920.

1. Sella decompression.
2. Sella decompression with excavation of lesion.
3. Sella decompression followed by radium and X-ray therapy.
4. Suprasella subtotal extirpation.

In selecting one or the other of these procedures a number of factors relating to the gross pathology of pituitary lesions must be taken into consideration.

Perhaps the first inquiry that one would make is this: Has the lesion already decompressed itself? If there has been a spontaneous decompression by erosion of the floor of the sella turcica, nature has accomplished all that the surgeon might have hoped to do had he in mind a simple sella decompression. But the removal of the floor of the sphenoid sinus, even after a spontaneous decompression, is of advantage in that the action of the radium is more effective when this partition of bone intervening has been removed, that is when the radium is applied, as has been our practice, through the nasopharynx. Unfortunately, radiographic studies do not always reveal the defect in the sella floor, in cases of spontaneous decompression, and the discovery is made on the operating table. The following is a case in point.

M. V. A. Age 50, File No. 63198. (Referred to the Neurosurgical Service by Dr. G. E. de Schweinitz.)

In 1911 the patient was refracted for glasses because of failing vision. Three years later her glasses were changed. Six months later she was again refracted and she then noticed that there was a haze over the right half of the right eye. In 1917 she was practically blind in the right eye and her vision in the left eye began to fail particularly in the left half of the visual field. Now she can read only the largest letters of the newspaper headings. Headache has been more noticeable in the past two months, and she has had occasional attacks of nausea. She has gained 20 pounds in the past two years.

Summary of Physical Examination.—O.D. sightless. O.S. vision $\frac{1}{30}$. Both disks show typically the appearance of pituitary atrophy. Temporal hemianopsia.

X-ray Report.—Characteristic sella deformation. Posterior clinoid processes atrophied. Encroachment upon sphenoid sinus.

Operation.—Subsellar decompression. Immediately upon removing the floor of the sphenoid sinus a pulsating mass presented, having the appearance of an adenoma.

Post-operative treatment.—X-ray crossfire through temporal regions. Radium therapy through nasopharynx.

Commentary.—Ten and a half years after the patient first complained of failing vision and seven and a half years before she was operated upon she noticed herself the increasing hemianopsia in one eye and yet even at that time the cause of her visual disturbance was not appreciated. It was not until the right eye was sightless and the left eye nearly so that she consulted Dr. de Schweinitz. This is the striking feature of this history, by no means a unique one. At the operation it was found that a spontaneous decompression had already occurred and had it not been for this she would no doubt have been totally blind. A subsellar decompression three years ago would unquestionably have conserved the vision in one eye and five or six years ago in both eyes.

Secondly, one should take into consideration in the selection of the surgical plan of attack to what extent the sphenoid sinus has already been encroached upon by the deformation of the sella floor. When the sinus, as revealed in the roentgenogram, is to all intents and purposes obliterated, but little relief will follow a sella decompression and such relief as there may be will be of but transitory duration. I could cite for illustration a number of instances where the roentgenogram showed the sinus practically obliterated.

Thirdly, has the lesion ruptured the diaphragm and is there already an intracranial extension? Unfortunately we have no reliable means of determining before operation the limitations of the lesion. We may have in the X-ray profile physical proof of the downward growth of the lesion, but from this no inference can be drawn as to the presence or absence of a suprasellar projection. We may assume, though not without confirmatory evidence, that the expansion of the lesion was primarily downward. Presuming the growth was primarily downward, at the time the patient was first seen the greater portion of the lesion may have been extra or suprasellar. Usually atrophy of the clinoid processes implies a rupture of the diaphragm and an intracranial extension, but in the earlier stages of the lesion the posterior clinoid processes may be still intact.

One of the first cases in my series was a case in point; it happened to be a pituitary cyst, but the extent to which the cyst had become an intracranial lesion would not have been known had I not chosen in this instance the suprasellar approach.

D. G. Age 23. (Referred to the Neurosurgical Service by Dr. Charles K. Mills.)

Résumé of History.—Five years before admission there developed a right-sided temporal hemianopsia. Consulted physician who prescribed potassium iodide in large doses. Later he was given deep injections into the buttocks. A year later there was a history of headache, nausea, and vomiting which has persisted. Three years after the onset he was totally blind in the right eye. A year before admission he developed a temporal hemianopsia in the left eye and lately the vision in this eye has become much impaired. He complained of physical lassitude and extreme thirst. He had an enormous appetite.

Summary of Physical Examination.—Small of stature with characteristic features of the Fröhlich Syndrome. O.D. sightless. O.S. temporal hemianopsia. Vision $\frac{1}{60}$. Both disks atrophic. X-ray report. Moderate but characteristic sella deformation.

Operation Transfrontal Exploration.—A large cyst projected between the hemispheres (see Fig. 1). Cyst opened, liquid contents evacuated and solid contents removed with scoop. Wound closed. Operative recovery.

Comments.—Again we have in this history a characteristic history of pituitary disorder, extending unrecognized over a period of at least five years, and treated by the so-called expectant plan (mercury and iodides), until at the time of operation the patient was practically blind in both eyes. In the roentgenogram there was no clue to the large intrahemispheric extension of the pituitary lesion. The sella turcica was only moderately enlarged and had I not elected in this case to expose the lesion by a suprasellar approach the dimensions of the intracranial extension would not have been known.

Even after the removal of the floor of the sella thus affording an avenue unopposed for the downward growth of the lesion, we cannot infer that the lesion will not grow upward at the same rate as if the sella floor remained intact. In this upward growth we have the explanation for the recurrences of visual disturbance which follow variable periods of relief after sella decompression.

Finally we cannot distinguish a primary intrasellar and a primary suprasellar lesion with secondary involvement of the pituitary. In this connection I may cite two illustrative cases.

L. T. Age 44. File No. 37190. (Referred to the Neurosurgical Service by Dr. R. E. Brennerman.)

Résumé of History.—Ten years ago her feet became noticeably larger and soon her hands. Coarseness of the features of the face was observed and later accession in weight. Six years ago the vision of the left eye became impaired and within a year she was totally blind in this eye. Within the past four months she has had difficulty in reading with the right eye.

Summary of Clinical Findings.—Physical signs those of dyspituitarism. Acromegalic features with marked accession in weight (former weight 120 pounds, present weight 210 pounds). Ophthalmic Report: O.S. sightless, O.D. hemiachomatopsia. Spinal pressure 18*mm* Hg. X-ray report: Posterior clinoid processes atrophied. Sella deformation characteristic of pituitary lesion.

Operation. — Cocaine anæsthesia. Transphenoidal approach. Sphenoid sinsu shallow. Upon removal of sella floor the pituitary lesion was exposed. Moderate pulsation but no attempt at herniation as seen when suprasellar pressure is marked. Partial excision of lesion. Wound closed and nares tamponed. Immediately after the operation the patient became wildly delirious, tossed about in bed, and could not be controlled. The delirium continued and she died the following day. The delirium was attributed to a susceptibility to cocaine. The cause of death was undetermined.

Comments.—In this case the interesting feature was the discovery at autopsy of a primary endothelioma, suprasellar. (See Figs. 2, 3, and 4.) The pituitary disorder was undoubtedly a sequel of the superimposed growth. That there was a lesion beyond the limits of the sella turcica might have been surmised from the atrophy of the posterior clinoid processes, but the nature of the suprasellar lesion could not have been even suspected. Again in this case there is the unconscionable delay and procrastination in the presence of unquestionable evidence of a pituitary lesion. The patient meanwhile loses the sight of one eye completely and of the other partially.

In exceptional instances the roentgenogram may indicate a suprasella lesion as in the following case, where there were deposits of calcified salts in the cyst wall by which the outline of the cyst could be detected in the roentgenogram.

J. E. Age 17. (Referred to the Neurosurgical Service by Dr. Wm. G. Spiller.)

Summary of History.—Since birth the mother noticed some impairment of vision. Seven years before admission began to have attacks of vomiting. These gradually subsided but were followed by severe headaches. Some difficulty in walking but no ataxia. Disposition irritable. Patient undersized, no growth since ten years of age.

Summary of Physical Examination.—Short stature. O.D. no vision in temporal field. O.S. sightless. X-ray report: Outline of a large suprasellar lesion clearly seen. Marked sella deformation.

Operation.—Transfrontal approach. Large suprasella cyst readily explored. Wall calcified. Partially removed with rongeur forceps. 100*cc* of reddish yellow fluid evacuated. Cavity of cyst swabbed with solution of tincture of iodine. Wound closed. Operative recovery.

Comments.—The deposition of calcium salts in the wall of the cyst was clearly portrayed in the roentgenogram. (See Fig. 5.) The preoperative diagnosis in this case was a primary suprasella growth with secondary pituitary involvement. As a matter of fact the lesion originated within the sella turcica. This case might be contrasted with the preceding where a suprasella lesion was not suspected before the operation and the pituitary symptoms were believed to be due to a primary intrasellar lesion. In the one case the preoperative diagnosis was a primary suprasellar lesion with secondary symptoms and at the operation a pituitary cyst was disclosed. In the other the preoperative diagnosis was a primary pituitary lesion and at the operation a primary suprasella endothelioma was discovered with secondary hyperplasia of the pituitary body.

Having in mind these facts relating to the gross pathology and growth of pituitary disorders on a theoretical basis the indications for the two methods of attack might be summed up as follows: (1) A simple sella decompression is indicated, (a) when there is no striking evidence of intracranial extension and (b) when there has not as yet been a spontaneous decompression. (2) The suprasellar approach is to be chosen (a) when spontaneous decompression has occurred and (b) when there is positive evidence of an intracranial extension. But this program, while theoretically consistent, does not take into consideration certain practical considerations. In the first place the suprasellar operation is a very much more formidable procedure not because of the nature of the exposure through a large cranial opening but because it implies an attempt at a more or less radical extirpation of the lesion. And, in the second place, we must take into consideration that, after the immediate though perhaps transitory relief of pressure by a subsellar decompression, the growth of the lesion may be arrested by the use of radium and X-rays.

For these two reasons, particularly, the program which I have adopted differs from the above and may be summarized as follows: If an operation is indicated in the management of the case, a simple subsella decompression is practiced with incision of capsule, but without attempting extirpation of the growth. Should there be a recurrence of visual disturbance, X-ray and radium are employed by an experienced roentgenologist. If, despite these, the condition is not under control, to prevent impending blindness, the lesion is exposed by a transfrontal craniotomy and removed in whole or in part.

With this rather long preamble, I come to the question of X-ray and radium therapy as an adjuvant of surgical intervention. There is now sufficient evidence at hand not only from my own clinic, but from other sources, to justify one's confidence in the efficiency of X-ray or radium as controlling the growth of pituitary lesions. Since the pathology of the thyroid gland is analogous in many particulars to that of the pituitary body one might have assumed that since X-ray and radium therapy has influenced the process in one it might influence the process in the other. Quite recently I have reviewed the literature on the subject of X-ray therapy of pituitary lesions and found a number of reports, such as those of *Jauges* (*Journal de Radiologie et d'Electrologie*, Paris, vol. 3, No. 11), Webster (*Archives of Radiology and Electrotherapy*, London, vol. 24, No. 8) and Becleri (June, 1920, *Médicin*), in which will be found unquestionable evidence of the effective control of this agency.

The first application of radium, in the treatment of pituitary lesion, was made for me by Dr. George E. Pfahler, in a patient who had recurrence of symptoms nineteen months after a sella decompression. The results in this case were so eminently satisfactory that, whenever possible, I have applied radium and X-rays as a routine practice immediately after the operation as a prophylactic measure. But prior to the inauguration of this plan I had under my observation 4 cases, in which neither X-rays nor radium had been employed until there were signs of recurrence and I will record in abstract the essential features in this series.

Case 1.—Recurrence of headaches and visual disturbances 19 months after a sella decompression. Following a course of glandular feeding, X-ray and radium therapy there was a disappearance of scotomata, restoration of normal vision, and reëstablishment of menstruation. There was no recurrence 4 years after treatment was instituted.

Female, age 30, consulted me November 27, 1917; nineteen months before she had been operated upon (sella decompression) for disturbances of vision due to an intrasellar pituitary lesion (struma).

At this time the following notes were made: Amenorrhea has been present for 3 years and still persists; aggravation of headaches; ocular disturbances; O.D. vision $\frac{6}{6}$, O.S. vision $\frac{6}{9}$; scotomata in both eyes.

Treatment.—Radium and X-ray therapy; thyroid and pituitary feeding.

Final observation June, 1920. Headaches not so severe, menstruation established after cessation of 6 years. Scotomata in both eyes entirely disappeared. Vision normal.

Case 2.—File No. 35795. Transfrontal hypophysectomy, August 25, 1917. April, 1920, 3 years and 4 months after the operation and treatment with radium and X-rays, the condition of the eyes was reported as follows: O.D. blind (before operation). O.S. slight improvement in field of vision as compared with previous examination. The roentgenogram shows no further enlargement of the sella and no further atrophy in the posterior clinoid processes. In other words there has been an improvement rather than a deterioration of vision extending over a period of three and a half years.

In the following cases X-rays alone were employed.

CASE 3.—Subsella decompression March, 1916. Improvement until August, 1917, then recurrence. In November, 1917, the roentgenogram showed the posterior clinoid processes still intact and there was a bitemporal quadrant defect. In April, 1918, X-ray treatments were begun, and in November, 1918, vision of both eyes was reported as improved. (The treatment was extramural.) In October, 1920, 4 years and a half after the operation and 2 years and 6 months after the beginning of the X-ray treatment, a letter from the patient says: "Last fields taken several months ago showed improvement. Sight not deteriorating. Taking X-ray treatments once a month and pituitary and thyroid feeding daily."

CASE 4.—February 15, 1915, a sella decompression followed by improvement. August, 1917, recurrence of visual disturbances; May, 1918, a second sella decompression followed again by improvement. December, 1918, X-ray treatments were begun (extramural). It was reported in November, 1920, 5 years and a half after the first and 2 years and a half after the second decompression that the patient had received 160 X-ray treatments; the improvement reached its maximum in July, 1919, but since then there has been a slight encroachment upon the fields.

The results in this series seemed to me convincing as to the advantage of the combined surgical-X-ray-radium treatment and justified the adoption of a subsella decompression, as the first surgical method of attack, in preference to the more formidable attempt at extirpation of the lesion by the suprasella approach. There is little advantage, I believe, in the necessarily limited extirpation that one can practice by the transphenoidal route, and this attempt at extirpation adds not only to the difficulties but the risks of the operation. At best the extirpation must be subtotal and with the limited exposure one can never be quite sure how much of the lesion may remain. We must, I think, recognize the limitations of any attempt at dealing radically with the lesion in any transphenoidal method and it is for this reason that I venture to call attention to the possibilities of X-ray and radium therapy combined with a simple decompression operation. One might ask appropriately, why operate at all. There are two valid reasons to justify operation: the first because substantial and immediate relief usually follows a sella decompression; secondly, because in the removal of the interposing bony partition, the floor and roof of the sphenoid sinus, the effect of radium upon the pituitary is thereby increased.

I now have under observation another series of cases, operated upon since the war, in which radium and X-rays are being applied by Dr. H. K. Pancoast at stated intervals. Sufficient time has not as yet elapsed to warrant the drawing of conclusions. In course of time the results in this series will be placed on record.

For the present at least I must rest my case upon the evidence presented in the series as above recorded. It is unfortunate that in two of these radium has not been employed. Whether in Case 4 the encroachment upon the visual fields would have followed had radium been combined with X-ray therapy is a matter of conjecture. At all events, in the other three of the four cases there has been no recurrence, four years, three years and four months, and two and a half years after treatment was inaugurated. The records of these cases are presented to direct attention to the possibilities of this combined treatment. Before its acceptance or adoption confirmatory evidence from other sources should be offered.

MOLLUSCUM CONJUNCTIVITIS.[1]

By Dr. HAROLD GIFFORD and Dr. SANFORD R. GIFFORD,
Omaha, Nebr.

(*With four illustrations on Text-Plates XIII.–XIV.*)

THERE are many cases of chronic conjunctivitis which resist all measures directed to the conjunctiva itself, in which we are obliged to look elsewhere for an underlying cause and for means of relief. Of these cases, there is one type, fairly uncommon, but still common enough so that a specialist should see one or more every few years, whose cause is sometimes overlooked by simply not having it in mind among the possibilities. These are the cases with a single or at most two or three nodules of molluscum contagiosum on or near the lid border.

These little nodules of the disease present a pearly white, waxy appearance; vary from a pin-head to a pea in size; and are usually quite easy to differentiate from milia, small warts, and fibromata by their central depression, from which a cheesy material can often be expressed. The central umbilication may in some cases, however, be very minute, and not noticeable to the naked eye, when, if no typical lesions are present elsewhere, sections may be necessary for a diagnosis. There are usually several lesions on the lids or elsewhere on the face, and they may be very numerous, but only one lesion may be present at one time. There is usually little or no irritation of the skin about them, which distinguishes them from acne pustules. This makes it the more remarkable that their presence, especially on the lid-borders, should sometimes give rise to quite marked conjunctivitis, often of a follicular type, with thickening of the folds.

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[1] From the Department of Ophthalmology, University of Nebraska College of Medicine.

The following reports of cases in which the growths were removed and diagnosis confirmed by section, will serve to illustrate the condition.

CASE 1.—Winston P——, a boy of fourteen, had been treated for blepharitis the past eighteen months. After not having reported for six months, he appeared with an acute conjunctivitis of the right eye, congestion being most marked in the lower fold. He showed a small nodule at the center of the right lid-border, which showed no central depression and was considered a wart. A zinc collyrium was prescribed and he did not return till three months later, when he still showed some conjunctivitis and the nodule was considerably larger, about 1.5 millimeters in diameter. It was removed, and sections showed the typical picture of molluscum contagiosum as seen in Figure 1.

Two years later he had developed no new lesions nor were any found elsewhere on the skin. His conjunctivitis was entirely relieved soon after the operation. He gave no history of any contact with cases presenting a similar condition. (One of the pieces of his nodule was placed in a subcutaneous pocket of one of our forearms, where it remained till it was absorbed without ever causing any irritation or new growth.)

CASE 2.—Mrs. J., aged 62, came in with the symptoms of conjunctivitis of both eyes. That in the left eye yielded to treatment with a zinc collyrium, while that in the right eye persisted for over a month. At this time, a small nodule $\frac{3}{32}$ of an inch in diameter was removed from the center of the right upper lid border. It was raised, with no central depression noticeable, but many small white dots scattered over the surface. Sections showed it to be a molluscous nodule (Fig. 2). The patient did not report for a month, and then still showed some thickening of the lower folds, though the conjunctivitis was considerably better. Nine months later she returned, showing no conjunctivitis, and stating that she had never had any other similar nodules.

CASE 3.—Mr. A——, aged 39, had been suffering with the symptoms of conjunctivitis of the right eye for six weeks. The right lower tarsus and upper fold were congested and roughened. The lid-borders were inflamed, and lachrymation was marked. At the junction of the middle and outer thirds of the right upper lid were two small white nodules almost one millimeter in diameter. They showed no distinct umbilication, but on squeezing one of them with trachoma forceps, a cheesy material was expressed. This was expressed thoroughly, and the other one was removed for examination. It showed the typical picture seen in Figure 3. The roughness and congestion persisted for several days till the patient returned home with a zinc collyrium and yellow oxide ointment. In two months he reported that his eyes had been relieved of symptoms soon after he reached home. No other nodules had appeared on the lids.

After four years, he reports no more trouble with the eyes, stating that he has had no more lesions elsewhere, and knows of no possibility of contagion in his case.

Case 4.—Mr. W., aged 25, came in complaining of soreness of the left eye for the past six months. During this time, he had been treated by several oculists with applications of copper, silver, and other agents with no improvement.

The left eye showed marked congestion with swelling of both folds and considerable discharge. In the center of the lower lid-border was a small typical molluscum nodule.

This was excised, sections showing the appearance seen in Figure 4. He was sent home with a zinc collyrium and zinc cerate ointment to apply to the lid borders. He has not been heard from since this time.

Case 5.—Mrs. S., aged about 45, was referred by an oculist of excellent ability and training on account of ulceration of the left cornea which had resisted two or three weeks of treatment with ordinary measures. She had an ulceration of about $\frac{1}{8}$ inch in diameter in the lower corneal quadrant, rather superficial, but with a good deal of infiltration of the borders. The secretion was slight, the lower conjunctival fold was congested and somewhat rough. The eye was unusually irritable and sensitive to light. About the center of the lower lid margin there was a typical molluscum nodule about $\frac{3}{32}$ of an inch in diameter. This was excised, whereupon the ulcer promptly healed under practically the same treatment that had been used before. The nodule was not examined microscopically. No other nodules were found.

Case 6.—Dr. A., age 42, had constant irritation of the left eye. This had been going on for the last six months. Had been treated as conjunctivitis with zinc collyrium, argyrol, and other antiseptics, with no effect. Examination showed marked congestion of the bulbar and palpebral conjunctiva of the left eye with a good deal of thickening of the lower fold and roughness of the lower tarsus. A small pearly white nodule about 3 millimeters in diameter was present in about the center of the left lower lid showing distinct central depression. The patient stated that this was the only similar nodule he had ever had on his lid, and that he never had any others elsewhere on his body. Under cocaine, this nodule was incised and the contents squeezed out with a ring curette, proving to be a mass of small gelatinous lumps. A collyrium of zinc chloride one grain to the ounce was prescribed and hot applications twice a day. The patient returned in two weeks stating that he had had practically no symptoms after about three days from the time the nodule was squeezed out. Congestion was much less, although there was still some thickening in the lower fold. The nodule has showed no signs of filling up with fluid and was drying up. Sections of the mass expressed from the nodule showed it to be composed of lobules of epithelium enclosing homogeneous refractile "molluscum bodies."

Including the cases above referred to, we have seen, in the last fifteen years, about a dozen of these cases in which persistent irritation of the conjunctiva has been kept up by one or two molluscum nodules at the edge of the lids. In none of them has there been any other evidence of the disease on the uncovered portions of the body, and the patients know of no other nodules of the sort, but they were not stripped for examination.

The diagnosis, except in the cases mentioned, was made from the characteristic appearance of the nodule. In more than three fourths of the cases only a single nodule was present. In one of the older cases, one of us inoculated a whole nodule from the cheek under his own skin, with negative results.

Literature.—The fact that molluscum contagiosum of the lid-border may cause an obstinate conjunctivitis, which is quickly relieved on removal of the lesion, though it must be well known to many clinicians, has received but scanty attention in the literature. The textbooks, while discussing the disease as an affection of the lids, give this phase of it practically no attention. There is no mention of its effects on the conjunctiva in Fuchs (1913), Ball (1916), Axenfeld (1919), Norris & Oliver (1898).

In 1895–96, occurred a rather amusing passage in ophthalmologic dialectic which must have brought some attention to the subject. Steffan (1) called attention to certain "adenomata" along the lid-border which he said often produced a conjunctivitis lasting till they were removed. He suggested that some secretion from the nodules, getting into the sac, irritated it, which irritation was increased by the patient's rubbing. He added: "Practice is forever teaching us things which are set down in none, not even the thickest of text-books."

To this De Wecker in 1896 replied (2): "Will you allow me, since I have on my conscience the preparation of one of the thickest textbooks, to remind you that in an unfamiliar case, one does not always take the time-consuming trouble to go through the thick textbooks."

He calls attention to the statement in his *Traité Complet* that conjunctival inflammations are often caused by very slight irritations of the lid border, which region should be examined carefully in cases of persistent conjunctivitis. He stated that the "adenomata" referred to could be nothing else than the nodules of molluscum contagiosum, and that he had opportunity to demonstrate their removal for the relief of conjunctival irritation before students almost every year.

Steffan (3) admitted that the nodules he referred to were molluscum nodules.

Muetze (4) reported three cases in which removal of the nodules relieved conjunctival irritation not yielding to ordinary treatment. One case had a recurrence requiring a second removal. This patient had cared for a child who developed molluscum about five weeks before she herself developed it. His diagnoses were proved by sections, and the typical picture is seen in his illustrations. He thinks the conjunctivitis is due partly to extension of the local inflammation from the skin to the conjunctiva, partly to an irritating secretion from the tumor being rubbed into the sac.

Oppenheimer (5) reports three cases of conjunctivitis of the follicular type associated with molluscum of the lids. They were cured by squeezing out the contents of the nodules with forceps. One had a recurrence after three months, which was cured by a second expression. There is no history of contagion in his cases, but one instance of infection from one lid to the other. He says Sachs and Elschnig reported several similar cases, but no reference to their work could be found.

Harman (6) mentions the reported association of molluscum with conjunctivitis but his experience leads him to believe that such association is one of coincidence, not of cause and effect. His cases of molluscum, one with twenty-five nodules on the lids, showed no conjunctivitis.

V. Michel (7) quotes Salzer and Muetze as stating that molluscum is a cause of persistent conjunctival irritation. He states that the site of election for the nodules is the lids and mentions a case of his own with 107 lesions on the face, fifteen being on the left lids and sixteen on the right.

Lauber (8), in a brief case report, describes a woman of sixty-three with numerous molluscum nodules and a follicular conjunctivitis.

Stelwagon (9) states that when the nodules are situated on the lid-borders, they sometimes produce considerable irritation and exceptionally a conjunctivitis.

As many cases of molluscum give no history of contagion, some doubt has been cast, lately, on the fact of its contagious nature, in spite of such evidence as the epidemic described by Mittendorf on Staten Island (quoted by Muetze), and Caillault's description (quoted by V. Michel) of its occurrence in fourteen out of thirty children living in one ward of an institution. There was no history of contact in any of our cases, and the result of inoculation in two cases gives only negative information on this point. Quite recently, however, Wile & Kingery (10) seem to have put this beyond a doubt by producing typical lesions in several human subjects by subcutaneous injection of the sterile filtrate from curetted lesions. They could thus study sections of the lesions in all stages and so obtain some idea of their natural history.

Discussion.—In the cases reported, there was in three some question as to the diagnosis, since the central umbilication was not apparent, and there were no other typical lesions present to guide us. In these cases, the nodules were removed and sections showed them to be definitely molluscous. In other cases where the lesions were more typical, the nodules were simply incised and expressed thoroughly. This was apparently equally efficient as in no case did the growths recur. We use a ring forceps with one side prolonged to a point, made to express trachomatous lids, but any type of forceps would be as good, provided pressure is made deep enough to express all the contents of the nodule, which often extends fairly deeply.

Though the symptoms are usually relieved quite promptly, instances such as Case 2 show that apparently changes are set up in the conjunctiva which may persist for some time after removal of the irritating agent.

As to the *modus operandi* of the nodules in causing conjunctivitis, it is hard to be definite. That it is not extension of the inflammation from the skin seems apparent from the usual absence of such inflammation about the nodule on the skin itself. The purely mechanical irritation of the nodule would appear to be almost negligible in some cases where it is not situated at the very lid border, but back among the lashes. It is possible that itching causes the nodule to be rubbed, and that in this way, some irritating secretion is carried into the sac which sets up the changes described.

Conclusions.—That molluscum contagiosum may attack the skin of the lids is well known.

That it may cause conjunctivitis is not well known to ophthalmologists, as is plain from the absence of any discussion of this point in many leading textbooks.

That a single minute molluscum nodule on or near the lid margin, even without the distinctive umbilication, may keep up a troublesome conjunctivitis or even an ulceration of the cornea which resists ordinary measures but which heals promptly on the removal of the nodule, seems to be practically unknown. This is the real excuse for the publication of this article.

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LACRIMAL SAC EXTIRPATION SIMPLIFIED.[1]

By Dr. ALLEN GREENWOOD, Boston, Mass.

(*With four illustrations on Text-Plate XV.*)

THE title of this paper indicates that no attempt will be made to bring forward a distinctly new operation, but to bring to the attention of Ophthalmic surgeons a description of the various steps in performing a most simple and speedy operation for the location and removal of the lacrimal sac. The method to be described has been used by the author for the past twenty years and has always been found satisfactory. Two reasons have made it advisable to give a description of this method: first, a careful perusal of the text-books on Ophthalmic Surgery and the chapters devoted to operations in regular Ophthalmic text-books has led to the feeling that a more concise outlining of a simple method for such an operation was very timely, secondly, during the past ten years that the author has been giving courses in surgery of the eye to postgraduate students at the Harvard Medical School, it has almost invariably been found that these men had been attempting this operation by the usual slow method of dissecting, layer by layer, to find the sac, with the frequent mischance of opening into the orbital fat, or of so injuring the sac as to make it difficult to remove it totally and most of them have said that they were loath to attempt an extirpation of the lacrimal sac on account of the many difficulties which they met when following the usual prescribed methods.

The author is greatly indebted to his confrere, Dr. Walter B. Lancaster, for his kindness in loaning pictures to show with the description of this operation. Dr. Lancaster has, for many years, been independently following the same plan of procedure, with equally satisfactory results.

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[1] Read before Am. Acad. Ophth., Oto-Lar., Kansas City, Oct. 14, 1921.

No attempt will be made in this article to differentiate cases that should best be operated on by extirpation from those that could be operated on through the nasal route or best be treated by some conservative methods, or destroyed by caustics.

It is taken for granted that in any case of disease of the lacrimal sac sufficient study and preliminary work shall have been given the case so that the operator has finally decided upon extirpation as the best operation for the individual case. Having thus decided he comes to the choice of operative methods.

A glance at the anatomy of the bony lacrimal fossa and the surrounding parts will help us to a clearer understanding of the procedures described. As Colonel Elliot well puts it, "the guide throughout the operation is the lip of the lacrimal fossa."

Figure 1 shows the nerve supply and clearly indicates points most suitable for the injection of novocaine in the method of extirpation of sac with local anæsthesia. In this illustration one also sees well marked the attachment of the upper and inner portion of the triangular ligament to the upper part of the posterior crest, thus allowing ample anchorage for the inner canthus even if the anterior portion of the triangular ligament is cut. The author has never seen any bad after-effects from cutting this anterior portion.

The patient is prepared as usual for such an operation and general or local anæsthesia brought about. Local anæsthesia is becoming more and more the custom, however.. Prior to making the incision it is well to place a strip of adhesive plaster across the closed lids over the eye on the side to be operated on. It is then the author's custom to outline on the skin with the finger nail the exact position of the lacrimal crest.

A small scalpel should be used and the incision started 1 or 1½ *mm* above the triangular ligament and the cut made *directly down to the bone* and following along the crest as close to the lip as possible downward and outward nearly *2cm* in length. On separating this wound with one of the special retractors, like Mueller's, or by the use of heavy silk sutures passed through the skin, as shown in Fig. 3, it will be found, if the incision has been made properly, that the bone is exposed all along the lacrimal crest. The next step is to have the assistant hold up the upper angle of the wound with a large strabismus hook, similar to the Smith cataract hook (Fig. 4.) This helps to control hemorrhage and enlarges the field of operation. With a knife an incision should now be made through the periosteum from above downward, if the first incision did not cut clean to the bone. This periosteum incision follows as close to the edge of the crest as possible. Usually about $\frac{1}{2}$*mm* is enough to prevent endangering a slipping over into the sac. On separating this periosteum to the crest it will be found difficult to go farther as here it is firmly attached to the bone and to the deep fascia which lies over the sac. In fact the deep fascia and periosteum are intimately interwoven at this point. It being impossible to separate the periosteum any farther a knife point can be used to cut through close to the bone and at once the sac comes into view (Fig. 2). The nick thus made should be enlarged upward and downward until the sac is thoroughly exposed (Fig. 3). The above method of finding the sac, which only takes a minute or two, has never failed in the hands of the author and the postgraduate students, after they have once had this operation properly demonstrated to them, seldom fail to find the sac easily and quickly. Following the exposure of the sac a periosteum elevator may be used to pry the sac from the anterior portion of the lacrimal fossa, this being part of the lacrimal crest of the maxilla and made up of heavy bone. Posterior to this, however, lies the portion of the lacrimal fossa which is made up from the nasal bone and here great care must be exercised not to perforate or enlarge the perforations which may already exist in this structure. At this stage the author prefers to use a strabismus hook, gently separating the sac from its posterior bed (Fig. 3). Two hooks are very useful for this procedure and after they have been passed behind the sac they can be moved up and down until the sac is well freed except at the dome and at the entrance to the canal. The above part of the operation can be done quickly, easily, and with no hesitation. The next step is a little more difficult, but is simplified by taking a broad hold on the temporal cut edge of the periosteum and fascia with a pair of fixation forceps. The deep fascia and periosteum are very much more prominent at the upper part where they are incorporated with the triangular ligament, and most easily seized at the lower part of the triangular ligament. Then the sac can be dissected from the deep fascia until it is possible to pass the strabismus hook completely around it. The hook can then be slid downward until it comes up against the bony ridge of the lacrimal canal. The sac is then grasped with mosquito forceps as low down as possible and cut off deep in the lower part of the fossa. The sac is now lifted out of its bed, the canaliculi cut and the dome of the sac separated from the upper part of the fossa. This is another point where a good deal of care is necessary because the sac at this point is very firmly adherent and usually has to be snipped away with the points of a pair of curved scissors.

The whole operation in the majority of cases need not take more than ten minutes. It is the author's custom to curette the lacrimal canal before closing the incision in the skin, but this is not always necessary and in patients who are operated on under local anæsthesia is apt to be rather painful, though this can be largely overcome by swabbing first with adrenalin and cocaine. The skin incision can be closed by interrupted suture, or as is shown in the accompanying cut, by continuous subcutaneous suture. The author is convinced that a more rapid healing is obtained if, at this stage, a suture is passed around the canaliculi both in the upper and lower lid, just to the nasal side of the puncta. This suture can be tied with a fairly tight knot ending in a bow knot so that it can be easily removed at the end of two or three days. This prevents tears from entering the space left after the removal of the sac during the process of healing. Sterile vaseline is applied over the region of the closed incision and pads of gauze of increasing size placed over the corner of the eye in such a way as to insure good pressure over the region of the lacrimal fossa. This dressing should not be removed inside of forty-eight hours and it is better left for even a longer period, when it can be removed and no further dressing is necessary.

It is very exceptional that healing by first intention is not secured and the patient allowed to go about his business at the end of the third or fourth day.

The resulting scar is so insignificant that it is soon lost in the natural skin creases at this point.

TWO UNUSUAL CASES OF PTERYGIUM.

By Dr. FUMIO YANO, in the Eye Department of the "Aichi" Medical College, Nagoya (Japan).

(*With one illustration in the text.*)

Case 1. A case of pterygium with cyst. Sugiura T., aged 65, farmer, had noticed a growth in the inner margin of the left eye for ten years, which did not grow until eight days ago, when it began to enlarge rapidly.

On January 19, 1921, examination revealed a growth extending from the inner margin of the left cornea to the plica semilunaris. The apex was united with a small surface of the cornea and the base merged in plica semilunaris without clear limitation. There was a cyst in the center of the pterygium 3*mm* in diameter, of a transparent yellowish-red color. Except for the pterygium there were no other pathological changes in the eye.

The apex of the pterygium was dissected away with a Graefe knife, the cyst cut out with scissors and the conjunctival defect closed with silk sutures.

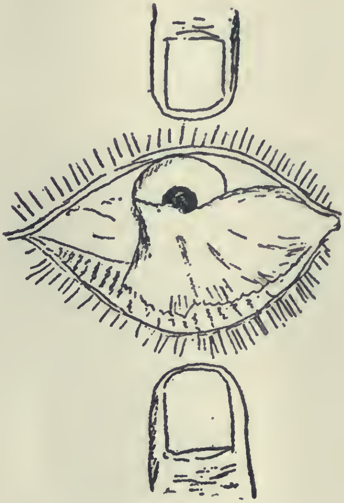
The structure of the cyst consisted in laminated pavement epithelium without any degeneration, and subconjunctival connective tissue with some blood vessels. The interior of the cyst was covered with cylindrical epithelium containing yellowish material; there was no glandular structure nor bone.

This case differs from a dermoid as it is progressive and contains neither hair nor bone. The condition is probably a pterygium which was at first nonprogressive, then has grown rapidly of late with the development of a cyst. Cyst formation in a pterygium is very rare and interesting. The cyst possibly arose from a lacrimal gland which is occasionally present in the bulbar conjunctiva.

Case 2.—A pterygium extending to the lower palpebral conjunctiva.

The following rare pterygium looked like a pseudo-pterygium, especially the so-called one of the upper palpebral conjunctiva, but in view of its progression, it is more like a true pterygium.

Ono S., aged 12, has had a small white opaque mass on the nasal corneal margin of the right eye for five years, and the diagnosis of pterygium was made. It did not grow until two months ago. There is no history of conjunctivitis or of any injury. There is a small pterygium on the nasal side in the left eye. In the right eye there is a membrane spreading from the lower lid to the cornea. It arises along the inner two thirds of the lid, *2mm* from the lid margin and is firmly adherent to the lower and outer quadrant of the cornea. The neck of the growth can be lifted up and is free. The cornea is otherwise intact, without any preceding inflammatory signs. The eye is normal.



Pterygium extending to the lower palpebral conjunctiva.

The growth is excised in two stages with a Graefe knife, the palpebral portion and then the corneal portion, and the defect is covered with a conjunctival flap without a peduncle. After the attachment of this, the other part of the head is dissected away in the same way and the flap with a peduncle taken from the temporal side is stitched to the other stitched beforehand.

The specimen is prepared for examination and found to consist of (1) epithelium: the laminated epithelium without degeneration, and (2) subconjunctival connective tissue which is a little thicker and more vascular.

A pterygium is generally situated at the nasal side of the cornea, rarely at the temporal; at the upper or lower margin it is very rare. It occurs in elderly, rarely in youthful persons.

This case resembles a pseudo-pterygium, but there is no history of corneal ulceration. There is a case on record of a band stretching from the upper fornix to the upper palpebral conjunctiva, which Schapringer (2) described as "Angeborene Schürze der Lidbindhaut." Similar observations have been made by Campbell (4), Monphons (3) as "Pterygium des oberen Lides," and Straub (5), Hoppe (6) and Wernicke (7). Schapringer explains the condition as due to the remnants of the amnion; according to Wernicke it follows an abscess of the conjunctiva; Monphons and Straub relate it to trachoma, and they all believe it to be a pseudo-pterygium. My case, being progressive, differs from the nonprogressive ones. There is a true pterygium which grows slowly toward the plica semilunaris, invades the caruncle and produces lacrimation; it is, however, extraordinarily rare. It occupies two thirds of the conjunctiva of the lower lid.

I express my thanks to Professor Oguchi.

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BILATERAL CIRCUMPAPILLARY CHORIORETINITIS WITH DETACHMENT OF THE RETINA IN SYPHILIS.[1]

By Dr. ARNOLD KNAPP, New York.

THE following case of retinitis is of interest on account of its circumpapillary distribution, and the complicating detachment of the retina which was cured by antisyphilitic medication.

History.—J. K., Japanese, aged 26, came to the Herman Knapp Memorial Eye Hospital on February 7, 1920, stating that nine days ago his vision had begun suddenly to fail in both his eyes. He had always been well except for headaches and had generally been constipated; two weeks prior to the loss of vision he suffered from severe frontal headache.

Examination of the Eyes.—February 13th, vision $\frac{3}{200}$. The field shows a defect occupying the upper half, and a well marked, irregular, central scotoma.

Slight ciliary congestion, corneæ clear, pupils dilated irregularly to atropine; the eyeballs are unusually soft, the intraocular tension in the right eye is 12 (Schiotz), and in the left 10. The disks are blurred and congested; the margins are ill-defined. The veins show some tortuousness, the arteries are normal. The fundus picture is striking on account of retinal œdema like that observed in closure of the central retinal artery; the color is not white but is distinctly green. This greenish discoloration extends well into the periphery. The retina around the optic nerve is raised like a wall, measuring +2 D. with the ophthalmoscope. In the lower part of both eyegrounds there is a very large retinal detachment.

A careful *general examination* by Dr. W. W. Herrick shows patient to be well nourished, skin dry, one fistulous opening in the gum above the upper central incisor tooth, thyroids small, superficial lymph nodes not enlarged except in inguinal region; lungs, heart, abdomen negative; urine negative; blood count normal. The Wassermann test is 4+. The stools contained a large number of active, motile, flagellate organisms. These were examined at the bacteriological laboratory of the College of Physicians and Surgeons and the organism was regarded as the trichoma hominis, a parasite which is found frequently in the tropics and is of no significance.

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[1] Read before Am. Acad. Opth. Oto-Lar. Kansas City, October 14, 1920.

The patient was given mercurial inunctions, calomel by mouth, and neo-salvarsan injections; atropine eye-drops and subconjuctival salt injections.

Feb. 18th: Slight ciliary congestion. There is more exudation and more congestion in the retina. A line of exudate passes up and down from the disk in the retina.

Feb. 23d: The œdema of the retina is somewhat less, and in the upper periphery the reflex is more pink. The detachment is perhaps somewhat greater; there are no hemorrhages; tension very much reduced; vision $\frac{4}{200}$; nystagmus.

Feb. 26th: Vision the same; optic disks more congested. There are a few hemorrhages in the right eye; the periphery in the eyeground is pink.

Feb. 29th: Vitreous slightly clouded. While the optic nerve is not swollen, the surrounding retina is very distinctly elevated, measuring +2 D. The veins are full, the arteries show no disease to the ophthalmoscope. The detachments have enlarged and nearly approach the disk.

Mar. 7th: More ciliary congestion; pupils medium; some corneal deposits; the retina is more normally red; the left optic nerve shows more congestion.

Mar. 12th: Vision improved to $\frac{8}{200}$; the fields have enlarged and the eyegrounds are clearer.

Mar. 14th: Vision R. $\frac{14}{200}$, L. $\frac{10}{200}$. Right eyeground much clearer, pupil dilated, eye is white, the detachment is distinctly smaller and flatter. Retina is pink; circulation is better though the veins are still broader than the arteries. The optic nerve is defined and pink. In the left eye there is some retinal exudation, especially on the nasal side of the disk, with a fresh hemorrhage up and in.

Mar. 19th: The right eye is clearer. The detachment is less. The left optic nerve still shows some blurring.

Mar. 21st: R. $\frac{15}{200}$, L. $\frac{12}{200}$. Field enlarged. The tension is better though it is still softer than normal. There is some ciliary congestion.

Mar. 25th: Vision R. $\frac{20}{100}$, L. $\frac{20}{200}$. Pupils are dilated. Eyeground is clearer; the detachment is much shallower; there are some dark areas in the retina.

Mar. 29th: The retina has lost its green appearance and is again transparent. There is no swelling to be seen. Some congestion of the vessels; detachment shallow. Vision R. $\frac{20}{100}$, L. $\frac{20}{200}$.

Apr. 11th: Vision R. $\frac{20}{70}$, L. $\frac{20}{100}$. Eyes are white, pupils dilated, some peripheric adhesions of iris; vitreous clear, tension normal. The optic nerves are distinctly blurred; some venous congestion; arteries show no abnormality; eyeground pink; some slaty gray areas in the retina but no choroidal involvement visible; right peripheric shallow detachment.

The patient then disappeared from view until July 2d; no treatment had been followed in the meanwhile. Vision is now $\frac{20}{30}$ in each eye. Field and tension normal. The eyes are white, pupils round, about 4*mm* in diameter, not reacting to light, slight contraction on convergence. The vitreous is clear. The optic nerves are pink with slightly blurred margins, the arteries show no particular disease. The eyegrounds show the changes of diffuse chorioretinitis, choroidal atrophy with choroidal and retinal pigmentation. There is no detachment.

The Wassermann test is 2+; the spinal fluid is negative.

Diffuse syphilitic retinitis presents a very definite clinical picture. It is one of the few characteristic clinical pictures of syphilis, and was first described by Jacobson and then carefully studied by Foerster. The opacity of the retina most marked at the margins of the disk and along the course of the large vessels, diminishes gradually towards the periphery and the disk is not prominent. There are no exudates or hemorrhages and characteristic dust-like vitreous opacities are usually present. The retinal vessels on careful inspection sometimes show delicate white lines.

A subdivision of this condition has been described as *circumpapillary retinitis.* The opacity and swelling of the retina are so marked as to form a wall around the disk, which, however, is not included in the general swelling. The reason for this localization of the exudate to this part of the retina about the disk is not understood as no pathological examinations have been made but it is probably due to an anatomical cause.

Dufour and Gonin (*Encyclopédie Française d'Ophtalmologie*, vol. vi., p. 874, 1906) describe a bilateral case in which the swelling of retina was so great as to appear in folds in the macular region. The opacity of the retina was just as noticeable as in obstruction of the retinal artery, but instead of a milky color the fundus presented a greenish-gray tint with white, tendinous reflexes. The retinitis occurred three to four years after infection and followed an iritis.

This is the only case which I could find in the literature where the greenish tint was observed similar to the case described in this paper. The green color to my mind is due to the presence of an albuminous substance in the inflammatory exudates situated in the deeper layers of the retina.

The retinal blood vessels did not show any obstruction and perivascular changes were not observed. The transition of the ophthalmoscopic picture to a chorioretinitis pigmentosa in a relatively short time (4 to 5 months) is unusual. The opacity of the retina sometimes persists for years, and the pathological progress is usually so slow that its termination in chorioretinal changes is rarely observed in the same patient, though Leber[1] says that this transformation in the ophthalmoscopic picture is quite definite. The symptoms in my patient were so active and the treatment so intensive that the course was unusually accelerated.

A very interesting and ominous complication in this case was the bilateral detachment of the retina which is very unusual in syphilitic retinitis. Uhthoff in speaking of the value of antisyphilitic remedies in treating detachment of the retina, says that though detachment of the retina in syphilitic retinitis is mentioned by several older authors (Galezowski, Hirschberg, Prouf, Gillet de Grandmont) he has never observed a case. This complication is not mentioned by Leber (*Graefe-Saemisch-Hess*) or by Igersheimer (*Auge und Syphilis*). As is well known, detachment of the retina occurs in nephritic retinitis especially in the more acute forms and in severe cases. It is generally bilateral and Leber found in 60 cases, 25 occurred in the retinitis of pregnancy and 35 in other forms of nephritic retinitis. The detachment is quite different from the ordinary detachment as it is distinctly an exudation presumably from the choroidal vessels and not due to a retraction process from within according to the teachings of Leber-Nordenson. Furthermore, tears in the retina are absent, and the readiness with which the retina reattaches in these cases is a striking proof of the dissimilarity of the process.

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[1] *Graefe-Saemisch-Hess*, vol. ix., p. 709.

The tendency to slight ciliary congestion, the difficulty of dilating the pupils with atropin and the unusual hypotony in the case described in this paper suggested an early interference with the function of the ciliary body. This in turn led to increased transudation from the vitreous and favored exudation fron the choroidal vessels with the development of circumscribed detachment of the retina which subsequently was cured as treatment progressed.

REPORT OF A CASE OF LIPÆMIA RETINALIS WITH HYPOTONY IN DIABETIC COMA.[1]

BY DR. MARTIN COHEN, NEW YORK.

THIS case is one of a severe diabetes mellitus with lipæmia and acidosis, associated with a characteristic appearance in the retinal blood vessels known as "lipæmia retinalis." This condition was first described by Dr. Heyl of Philadelphia in 1880. About eight cases are reported in the literature.

In my opinion this condition might better be considered as a lipæmia angio-retinalis, not a lipæmia retinalis. Lipæmia is a condition of increased fatty bodies contained in the blood, occurring physiologically after meals rich in fat; and pathologically in certain diseases, especially in diabetes mellitus, where is is most marked. The quantity of the total fat in the blood rises from normal, 0.6, to 0.7 per cent. to as high as 10 to 20 per cent. Coincident with the increase of the total fat, there is a rise in the cholesterol content, which normally is 0.14 to 0.16 per cent., rising as high as 1.5 per cent.

In this case we have conditions strikingly characteristic.

The patient is a school boy, 14 years of age, who entered the Harlem Hospital on October 16, 1920, complaining of marked weakness, frequent urination, great thirst, and pain in the right leg. He had been in good health until the previous April, when he complained of weakness, became quite pale, and was losing in weight. At this time he consulted a physician, who found sugar in the urine. Later, he went to the Fordham Hospital where he remained fifteen weeks, leaving there three weeks previous to his admission to the Harlem Hospital. His condition had become steadily worse, and when admitted he was unable to use his right leg.

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[1] Read before the Section on Ophthalmology, New York Academy of Medicine, January 17, 1921.

Physical Examination.—Showed a poorly nourished, pale boy, with normal cardiovascular and respiratory organs. The cervical glands were palpable and soft, and a soft fluctuating mass was found in the right popliteal space, which was considered to be an abscess. He was alert, but complained of marked weakness and thirst.

The ophthalmological examination was made the day after admission, while the patient was in a state of diabetic coma. Functional tests were impossible. The intraocular pressure in both eyes was decidedly reduced, being extremely soft, or in a state of hypotony.

The iris, excepting that the reaction to light in both eyes was sluggish, was otherwise normal. The pupils were of normal size and location. The media were clear, excepting the aqueous of the left eye which was slightly turbid, due to a fibrinous exudate.

The fundus examination was made with the electric ophthalmoscope, and showed both fundi to be of the tesselated type. This lack of retinal pigment has frequently been referred to in diabetic cases and should be noted.

The disk, retina, and choroid of both eyes were similar in appearance, excepting the fundus in the left eye, which showed two recent small circular hemorrhages situated in the retina. One was above the disk, the other to its nasal side. The disks had a grayish appearance, most marked on the temporal side. The outlines were sharply defined. The maculæ in both eyes were normal. The choroidal vessels and spaces of both eyes were similar and normal in color and size. The retinal arteries and veins of both eyes were also similar in all respects, but the lumen was apparently slightly dilated throughout. The relationship of the size and color of the arteries to the veins was such that they could not be distinguished apart, excepting on the disk where the arteries were slightly narrower than the veins, and they had a fine streak in the center, indicating the blood stream. The color of the retinal vessels from the center to the periphery, namely from the main trunk to the capillaries, was decidedly milky in appearance throughout. This is strikingly characteristic for the fundus diagnosis of lipæmia retinalis, which condition can be readily recognized, since it is impossible to be confounded with any other fundus lesion.

The laboratory findings, 36 hours before death, were as follows: The blood sugar was 282*mg* per 100*cc* of blood, about three times the normal. The CO_2 combining power of the blood was 9*cc* per 100*cc* of plasma, being about one sixth the normal (Van Slyke method), the lowest on record. The total fat content of the blood was 8.95 per cent., over ten times the normal (Bloor's method). The cholesterol was 1.12 per cent., about six times the normal (Meyer's method). Urea nitrogen 9.3, slightly reduced. Total chlorides 300*mg*, about two thirds the normal. The blood count showed 3,150,000 red blood cells; hæmoglobin, 30 per cent.; 15,600 white cells, 76 per cent. of which were polys. No abnormal cells. The urine had a specific gravity ranging from 1023 to 1028 and showed a marked increase of sugar.

Acetone and diacetic acid were also found. The aqueous and vitreous from both eyes after death showed no cholestrol.

The day after admission the boy complained of air hunger and went rapidly into coma, and within forty-eight hours after admission to the hospital, he died. Autopsy of the eye or body could not be obtained.

It is known that if blood from a lipæmia patient is allowed to stand in a test tube or is centrifuged in order that the cells may fall to the bottom of the tube, the serum will have a cream color, owing to the high content of the fat in suspension. Such was found to be the case in this boy; furthermore, when blood smear was stained with Sudan iii, numerous fat globules were readily seen in the plasma.

This case is of interest not only because of its rarity, but because of the speculation which naturally arises as to whether the changes in the eye can be satisfactorily explained by the disturbance in the general metabolism, characteristic of a fulminating diabetes, or whether other factors more or less unknown play a part.

Histo-pathological examination of the eyes made by four authorities in previously reported cases, showed no changes in the walls of the vessels of the retina or choroid. We have shown that in this case the blood contained an enormous amount of fat and that the retinal vessels had a milky appearance.

The logical explanation would seem to be that the milky appearance of the retinal blood vessels was due to the state of the blood. However, when whole blood was drawn from the patient, it had a chocolate color, and it was not until the serum separated that the creamy appearance was noted. It seems possible, then, that the milky color of the retinal vessels is not due solely to the chemico-physical state of the blood itself, but that in the readily flowing blood the red cells tend to congregate in the middle of the lumen of the vessels, so that the area at the edge of the lumen of the vessels instead of being clear is opaque, because of the lipoid bodies in the plasma.

This localization of the lipoid bodies is not solely due to its specific gravity, but also to the rate of the blood current present in the terminal retinal vessels.

That the choroidal vessels appeared normal ophthalmoscopically, is explained by previous observers as an optico-chemical phenomenon, due to the reflection of light from the pigment of the retina and chorio-capillaris to the retinal vessels which appear milky. This, however, does not seem to be a sufficient explanation. It is my opinion that the anatomical structure of the choroidal vessels with their wide arborization, anastomosis, and extensive venous outflow may play a part in accelerating the blood current so that the red cells may not congregate mainly to the center of the blood stream as they do in the retina, but also to the walls of the vessel. The milky color probably is not seen in the choroidal vessels because the rate of the blood current does not permit an observable separation of the lipoids from the red cells.

The apparent dilatation of the retinal vessels is explained by the fact that normally a clear zone is seen at the inner wall of the vessels; while in these cases this area has a milky color in its entire course. Previous observers have never reported hemorrhages in the retina or choroid. The retinal hemorrhages in this instance may denote a diseased condition of the blood.

Hypotony was noted in Heine's case, but he was unable to find this condition in other cases of severe diabetes mellitus.

Since reporting this case, I have had the opportunity, through the courtesy of Drs. Shearer and Killian, of examining a patient at the Lincoln Hospital.

The patient was a laborer, 27 years old, who was admitted to the hospital on January 28, 1921, in a state of diabetic coma. His wife stated that he had never been sick before. His present illness was of only two days' duration. He appeared weak, but was not emaciated. Physical examination showed nothing abnormal. Ophthalmological examination was made the day following admission, just as the patient expired. The intraocular tension of both eyes was very soft, or in a state of hypotony, which corroborated the findings on admission. The pupils were markedly dilated and non-reactive to light stimuli. The media were clear, the disk, retinal, and choroidal vessels were normal. The blood chemistry on admission was as follows:—Urea-nitrogen, 35*mgs* per 100*cc* of blood; creatinine, 2.6 per 100*cc;*

chlorides, 488 per 100*cc;* sugar, 1150*mgs* per 100*cc*; diastatic activity, 62; CO_2 combining power, 13*cc* per 100*cc*. Spinal fluid sugar, 650*mgs* per 100*cc*. White blood cells, 25,000; 85% polys. The patient died the day after admission. A complete necropsy showed no gross pathological changes. The patient's death was due to diabetes mellitus. It was associated with hypotony, but there was no lipæmia.

The hypotony in these cases is probably due to a dehydration of the fluid media of the eye, as occurs in other parts of the body. In other wasting conditions, hypotony has not been found; nor has it been noted in the coma and exitus from other diseases. In concluding, I would state that it seems probable that as the internist of to-day employs the electric ophthalmoscope more generally as an aid in his routine physical examinations, future fundus examinations may disclose more cases of lipæmia retinalis; also external ocular examinations may show the presence of hypotony associated with certain conditions of diabetes mellitus.

My thanks are due to Dr. John A. Killian for the chemical analyses of these two cases.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. H. DICKINSON, London.

An ordinary meeting of this Section was held on Friday, January 14th, **Dr. James Taylor**, the President of the Section, occupying the chair.

Mr. G. Winfield Roll showed a man who had had a fragment of steel embedded in his eye for 18 years. Soon after the particle entered the eye, a skiagram located it in a direction up and out. The man said he was blinded for a week immediately afterwards, but the trouble then passed off, and he had not had any eye difficulty since. When seen a few weeks after the accident vision was $\frac{6}{6}$, and the media were clear. A tiny nebulous spot was now to be seen in the neighborhood of the limbus. Mr. Roll did not consider it a case calling for interference, as the vision was good, the eye was quiet, and a good time had elapsed since the accident. Latterly, however, vision had gone down to $\frac{6}{18}$. The only change in the ophthalmoscopic appearances after all this time was the development of an area of atrophy below the foreign body, with a slight deposition of pigment at the same site. There were also a few vessels, which were either remnants of the choroid vessels, or were collaterals. He mentioned a case from the American *Journal of Ophthalmology* in which a foreign body had remained in an eye 29 years, and said he did not see why there should be any limit to such residence provided the body was aseptic and was not causing trouble.

Mr. W. T. Holmes Spicer thought the changes in the neighborhood of the choroid were due to the presence of the foreign body. Siderosis sometimes followed from such bodies in the eye, and in this case there was probably a local siderosis. One man under his care had had a piece of metal in his eye three years before any siderosis developed, and then the eye turned a rust color.

MR. A. HUGH THOMPSON showed a case in which there were **disks with large intermarginal cups,** without, as yet, any symptoms of glaucoma. The tension was normal. Sometimes the eyes were misty, but the patient, a woman aged 52, never saw rainbow colors, and no lens opacity could be made out. He considered that this case was on the way to the development of glaucoma. It was now at a stage when various opinions would be sure to be expressed.

MR. MALCOLM HEPBURN showed a case of **coloboma in the macular region.** It was difficult to justify that term, but if ever there was such a case, surely this was one. It had a pearly-white center with a definite ectasia on the temporal side of the patch. He considered the condition to be very rare.

PROFESSOR SALAMONSEN, of Amsterdam, demonstrated an ingenious set of instruments for photographing and demonstrating to students the interior of the eye.

MR. HUDSON showed a new form of perimeter, and DR. RAYNER BATTEN demonstrated, by means of rubber balloons, what he termed deep tension, which, he argued, had its analogue in the eye, and when present in that organ indicated the imminence of glaucoma. It was elicited and measured by dimpling under a definite pressure.

The Size of the Physiological Cup in Relation to Glaucoma.

DR. RANSOM PICKARD, of Exeter, read a paper entitled: **Variations in the Size of the Physiological Cup and Their Relations to Glaucoma.** The cases reviewed in this paper were a consecutive series, eliminating only cases of actual glaucoma and other diseases affecting the disk. The objection might well be raised that the patients came because they had some affection of the eyes and that they were not simply a part of the general population; still, the total numbers dealt with in the later age-groups corresponded very closely with the general population age-groups in the county (Devon). Glaucoma was so rare under forty years of age that cases might be taken, from this standpoint, as normal. The older the patient, the greater the assumption that pathological changes had occurred, glaucoma accounting for a large proportion of these. Where necessary, the tonometer for pressure, and the screen for the field of vision were employed. The shape and size of the disk and the cup were carefully drawn in each case, and transferred, by means of carbon, to graph paper. The area of each disk was then measured, and the results were reduced to a percentage, 100 being taken as the total area of the disk. The cases were grouped in ten-year periods. The myopic cases had large cups, though there were only two groups (16–25 and 26–35 years) in which the largest myopic cup was not exceeded by a hypermetropic cup.

Explanation of the alterations in normal disk cups involved, he said, many difficulties. An alteration in the size of a cavity situated in a solid like the sclerotic and filled with a viscous fluid might conceivably occur under three conditions: (1) no alteration in pressure; (2) tension from without, as in the contraction or disappearance of nerve fibers or fibrous tissue. In the present series cases of this kind were excluded. (3) There might be pressure from within, *i.e.*, pressure exerted by the vitreous, as in glaucoma. He submitted a twofold suggestion: that the tissues of all disks were not equally strong, and that small increases of pressure acting on the weaker disks over long periods might cause an enlargement of the cups in those cases, but not to the extent of interfering with vision.

Dr. Pickard went on to show, by means of the epidiascope, the various shapes of physiological and glaucomatous cups he found. In the former there was certainly pressure from within. The glaucoma cup was usually a simple and symmetrical enlargement of the physiological cup; in a smaller number the conical enlargement was added onto the usual cylindrical form. If most of the glaucomatous cups were enlargements of the physiological cups caused by internal pressure, then, presumably, smaller degrees of pressure, acting on cups in which the tissues were weak, would cause lesser degrees of enlargement, without necessarily producing any deterioration in vision. Very varying degrees of tension came on in middle life without symptoms arising from it. Pressure was not the only factor; the resistance of the disk must also be taken into account. Only those cases should be included under the term glaucoma in which there was sufficient pressure to interfere with the function of the organ; in the cases of high pressure without such interference the pressure must be regarded as a danger-signal. In these latter cases an accurate and thorough investigation should be periodically carried out, and all predisposing causes as far as possible eliminated. The author admitted that his main contention, that there was a tendency for the physiological cup to enlarge with advance in age, was not proved but only inferred. Much might be done, however, to confirm or refute the idea by systematically studying and following out a few cases over a course of years, with accurate diagrams taken at certain intervals.

Mr. A. Hugh Thompson said the paper supported the view that there was a distinct relation between a large physiological cup and a glaucomatous cup. In more than one of his own cases there was an undoubted glaucoma in one eye, and a large overlapping physiological cup in the other. Also, when ordinary glaucoma had occurred in one eye, there was a considerable likelihood of the same condition developing in its fellow. The author's suggestion that physiological cups were changed into glaucomatous ones owing to unequal resistance of the lamina cribrosa coincided with his own view. But he did not think that was the usual mode of causation. The ordinary glaucoma was that of the textbooks, in which the pathological condition began at the margin of the disk. He did not think the author had sufficiently emphasized the distinction between ordinary shallow cup, such as most disks presented, and the perpendicular cup, the latter often overlapping, so that the vessels came to the edge of the cup and disappeared from view, until again seen in the lamina cribrosa.

Dr. Rayner Batten spoke of the need of some method of recording cases of central cupping; he did not think the recording of the area alone supplied what was chiefly wanted. The dangerous cups were indicated by their shape. So long as the cupping was restricted to the center it might be looked upon as Nature's trephine hole. Nearly all the cups mentioned in Mr. Pickard's paper seemed to have been central. The cups he, the speaker, was acquainted with generally came quietly up on the temporal side and expanded from there: rarely on the nasal side. Cups would increase under normal pressure. When deep tension and a large physiological cup coexisted, it seemed to require a slight cause to render the eye glaucomatous.

Mr. M. S. Mayou said the pathological difference between the two forms of cupping was very great. The physiological cup was merely the cone of nerve fibers passing into the nerve, whereas the glaucomatous cup was a pushing back of the whole lamina cribrosa. This produced not only a steep-sided cup, but often, in sectioning the disk, one could see the cup bulging out under the sclera on either side. Cupping was dependent not only on the intraocular tension, but also on the condition of the nerve fibers as they passed through the lamina cribrosa. The essential difference was seen when the cupping passed to the margin of the disk.

Mr. Pickard, replying on the discussion, spoke of his careful work on borderline cases, for it was in those he considered that the true cause of glaucoma would be revealed. He did not consider that the enlargement of the ordinary physiological cup was the cause of most cases of glaucoma, but in a group of cases that was so.

A meeting of the Section was held on Friday, February 11, 1921, the President of the Section, **Dr. James Taylor**, occupying the Chair.

Commotio Retinæ with Extreme Œdema.

Mr. F. A. Williamson showed a boy, aged 15 years, who six days ago received a blow from a suspended rope in the right eye, and it was immediately followed by loss of sight in that eye. He was first seen four days ago, and during the interval the œdema had decreased a good deal. The macula was of a reddish-brown color, and there were two horizontal folds in the retina. He raised the question as to whether the concussion alone could account for all the œdema present. When the eye became more quiet, some of the obscure features might be cleared up.

Mr. J. B. Lawford said that but for the definite time-association of the injury and the œdema he would have suspected that the concurrence of the two conditions was mere coincidence. If there had been rupture of any important vessel, the hemorrhage would have been evident. The folding of the retina was very striking.

Mr. Leslie Paton said that when he first saw the case it presented almost the typical picture of central embolism of the retina. It was still likely there might be blockage of a vessel the result of the concussion, though he had never seen so much œdema as a result of simple commotio. There might be a tearing of a nerve which affected a vessel and the hemorrhage had not come forward.

Dr. G. Mackay referred to a case which followed a blow from a tennis ball, and agreed with Mr. Paton's suggestion on the present case.

Artificial Eyes and Lids Attached to Spectacle Frame.

Messrs. Oliver and Jackson, attached to the Sidcup Hospital for Deformities, gave a remarkable demonstration of facial improvement brought about by their imitation of the appearance of the normal eye on the spectacle frame of those who during the war had received wounds of the orbit resulting in evisceration. They were highly commended by all the speakers.

Corneal Loupe.

Mr. Basil T. Lang showed an ingenious corneal loupe for removing, unaided, a foreign body from the cornea. At Mr. Holmes Spicer's suggestion, he had added a transilluminator device.

Mr. Lang also demonstrated his scotometer, for which ordinary unprepared paper could be used, and the observer could watch the patient the whole time. He reminded members of the important observations which could be made with the scotometer.

Scotometry.

Mr. Basil T. Lang also read a paper on the subject of Scotometry. He said that in scotometry one was concerned with more or less blind areas surrounded by more or less healthy seeing retina, and was usually applied to areas within 40° of the fixation point. It only differed from perimetry in involving a more detailed examination. Two types of scotomata were recognized: absolute and relative, the latter when an area of the retina, while able to appreciate brightly lighted white objects, was unappreciative of certain colors or gray. Among the points to be considered in determining the size of a scotoma were: illumination, size of the object, color of the object, color of the background, distance of the object, scale and size of the chart, and method of making the observations. If quite a small object were brilliantly illuminated, it might be visible over an area in which a less bright but much larger object could not be seen. In arriving at scotomata, therefore, the light used should not be too brilliant, and direct bright sunlight should be avoided, especially as natural light varied in intensity and color with season. No standard of artificial illumination had yet been agreed upon, but that from a single carbon filament lamp was quite suitable for this purpose. The size of the object should be measured in terms of the angle it subtends, not by the length of the edge. If using a small object, the patient should be in the best position to see it, and if presbyopic, he should be wearing his correction. Green was less easily seen than red, red than blue, and blue than white. There should be a marked contrast between the color of the object and the background, and the latter should not reflect light. The question of the distance at which the observations should be made was a controversial one; but if working very close to the patient it was difficult to move the object sufficiently slowly to give the patient time to form and convey his impressions. Quite accurate observations could be made at one third of a meter distance. The scale and size of the chart were matters of personal convenience. There were many methods, and he laid it down that a good method should be easy to employ, should give accurate results, should enable a permanent record to be made easily, and should enable the observer to watch the patient during the whole examination, to counteract eye wandering. He proceeded to describe and demonstrate his scotometer, and to discuss the features of other makes. Possibly a patient with high hypermetropia might be the subject of increased intracranial pressure, and then arose the question whether the swelling of the disk was physiological or pathological. It was probably the former if the disk when determined with a dull green was no larger than with a brilliant white light. In some cases of tobacco amblyopia and of retro-bulbar neuritis scotomata for green and red, or for green only, might be found; but the chief purpose of scotometry was to determine an increase of the blind spot in suspected glaucoma.

Mr. Bishop Harman contended that it was an advantage to be unconscious of the progress of delineating the scotoma until it was completed, as the mind might otherwise be influenced by what was expected. Every effort should be made to exclude the personal equation, and that had been his aim in his own scotometer, which did also enable the observer to watch the patient.

Dr. A. H. H. Sinclair (Edinburgh) referred to the work of previous observers in this field, especially Bjerrum, Runner, Walker (of Boston), Traquair (Edinburgh), and himself. All those observers realized the importance of using a very small test object. He thought the screen should be at a sufficient distance to so enlarge the scotoma that its details could be studied. The scotoma of interest in early diagnosis was the relative one.

Late Infection after Sclerostomy.

Mr. T. Harrison Butler (Leamington) read a paper with this title. It opened with a historical sketch of the work of von Græfe, Grosz, Lagrange (who discovered the first method which could be relied on to produce a filtering scar), Herbert, Evans and Allport, Holth, Freeland Fergus, and Elliot. Mr. Harrison Butler said the conclusion was that the modern fistulizing operations were more efficient in reducing hypertension than was iridectomy, but that the danger of late infection was a serious offset which had deterred many from performing sclerostomy, driving them to older but less efficient procedures. He had himself treated eleven eyes the subjects of such late infection, and some of the patients had had a second or a third attack. These tragedies caused him to abandon sclerostomy and revert to iridectomy; but the results of a series of cases were so futile that he reverted to trephining, and a comparison of his later results so completely vindicated the fistulizing method, that he did not propose again to perform iridectomy for glaucoma simplex. His statistics gave 45% of successful iridectomies, as against 75% of good results from sclerostomy. During 1918–19 he trephined 40 eyes for glaucoma simplex, and until recently all had been successful. Two had re-appeared with raised tension, and had been trephined with success. On reviewing his cases over the last five years, he found all the late infections had followed the trephine operation and Holth's punch operation. He discussed a number of informing cases in detail. It was obvious, he said, that the scar left by the punch was far more vulnerable than was the trephine scar: probably there was more bruising. A button-hole was a serious menace, but in some cases the conjunctiva was so friable that it might tear. The Holth operation belonged to the past. He thought hypertony was one of the conditions favoring late infection. In many of his unfavorable cases alcohol had been a factor. When he knew staphylococcus albus was obtainable from the conjunctival sac, he refused to operate. In order to avoid late infection, he thought the operation should not be regarded as an easy one; a perfect technique should be cultivated, and, consistent with good work, the operation should be done as quickly as possible; the flap should include all the tissues, and should not be bruised. Any local septic focus should be searched for. As an antiseptic lotion for use all the time, he advised a 1 in 10,000 solution of oxy-cyanide of mercury, used nightly in an eye-bath.

Mr. S. H. Browning asked whether the eyes were examined bacteriologically before operation, and, if so, by what method. If by Elschnig's method, that did not receive general approval. Pneumococcal infections in the eye were quite common. The presence of pus was apt to be deceptive, and should not be the only thing looked for, as eyes apparently healthy were found to contain pneumococci, streptococci, and even staphylococcus aureus, in numbers to warrant postponement of the operation.

Mr. Leighton Davies (Newport) emphasized the importance of a sufficiently thick flap; a thin one might lead to late infection.

Mr. M. S. Mayou agreed that a thick flap was an important protection against infection. Another protection was the amount of fluid leaking from the anterior chamber through the trephine hole. He had had only one case of late infection after trephining; he had seen two others, and in all recovery was good.

Mr. Harrison Butler (in reply) agreed as to the adoption of good methods of ascertaining whether the conjunctival sac was sterile, but for practical purposes he used a 48-hour culture on agar.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. CONRAD BERENS, Jr., Secretary.

MEETING OF JANUARY 17, 1921. DR. L. W. CRIGLER, CHAIRMAN.

Doctor John M. Wheeler showed seven patients to illustrate **different types of plastic eye cases.**

The first case illustrated the result of the repair of a notch of the right upper eyelid. The injury was a war wound which resulted in complete division of the tarsus with angulation of the lid. Dr. Wheeler had performed the "halving" operation devised by him for such cases, which was described in his article on "War Injuries of the Eyelids," published in the Archives of Ophthalmology, vol. xlix., No. 1, 1920.

The second case showed the result of restoration of the upper cul-de-sac by an epidermic graft. The operation was performed about two years ago, and the result was perfectly secure. The patient has been wearing a prosthesis with good cosmetic result.

In the third case, complete restoration of the cul-de-sacs had been accomplished by an epidermic graft. The eye and conjunctiva had been lost as a result of a lye burn. Both upper and lower cul-de-sacs were restored at one operation by a single epidermic graft from the thigh. There is no break in the skin lining and the cul-de-sacs above and below are ample.

The fourth case had been operated on by pedunculated flaps. A gunshot wound resulted in a coloboma of the nasal part of the left lower eyelid. A part of the orbital margin below was absent as was a part of the anterior surface of the superior maxillary bone. In the summer of 1918, Dr. Wheeler operated three times to restore the lid margin and the tissue below it. In one operation, a flap of skin and subcutaneous tissue was dissected back to the ear, and this was advanced in such a way as to turn the nasal end upward and fill in the gap occasioned by loss of tissue which had been caused by the gunshot wound. The result was satisfactory.

The fifth patient presented severe burns of the eyelids, face, neck, and chest, due to a fall into hot coals in a manufacturing plant. Dr. Wheeler had operated on all four eyelids, using large epidermic grafts from the thigh. On each side appeared three adhesions between the lid margins, planned for the support of the lower eyelids. The grafted skin could be discerned on the four eyelids. The adhesions between the lids will be left for several months.

The sixth case had been operated on for cicatricial ectropion, resulting from burns from a gasoline explosion. Two adhesions between the lid margins could be seen. A free dermic graft had been taken from the left temple and implanted in the right lower lid. Dr. Wheeler called attention to the fact that the patch of grafted skin matched rather well as to color, but it was slightly thicker and less pliable than the surrounding lid tissue.

The seventh case showed the finished result of operation for cicatricial ectropion of the right lower eyelid. A detached graft of true skin had been taken from the right upper eyelid and placed in the right lower lid. The correction of the ectropion was complete and by ordinary inspection the outlines of the grafted tissue could not be seen.

DISCUSSION: DR. CRIGLER thought the epidermic graft used in restoring the cul-de-sac was superior to the Wolff graft. The main difficulty seemed to him to be the problem of obtaining the graft without perforation. This Dr. Wheeler seems to have overcome.

DR. MARTIN COHEN reported a case of **lipæmia retinalis** with hypotomy in diabetic coma. (The report of this case appears on page No. 247 of this issue.)

DISCUSSION: DR. WOLFF saw a man in the Mount Sinai Hospital suffering from diabetes mellitus, where there was an unusual pale purple tint seen in the vessels. He was told later that the patient had lipæmia.

Dr. H. H. Tyson presented a case of **bilateral metastatic choroiditis** following pneumonia, in a baby 13 months old. The mother stated that the child had been ill with pneumonia for two weeks and that his eyes were red, and after one week the pupils appeared white and the child could not see. Previous to illness child enjoyed good health and apparent good vision. Examination revealed vitreous chamber filled with yellow-white exudate, posterior synechias, irregular pupils with the periphery of the iris retracted. Tension slightly diminished and circumcorneal injection.

Dr. Broughton presented two cases of **tumor** of the **iris.**

Case No. 1, A. W., 21: A brown spot was noticed in the iris of the left eye two years ago, though his mother believes that it always has been there. About four months ago the left eye became blurred for a few hours and another attack occurred in November, 1920. The vision in this left eye is normal. There is a tumor measuring 4½ by 2½*mm* in the lower inner quadrant of the iris, extending from the periphery to the pupillary margin. The surface is in contact with the posterior area of the cornea; it is bluish in color with two small bright red spots. There are in addition a number of additional brownish red fine spots throughout the tumor. All tests are negative and the tension normal.

Case No. 2, M. D., 52: A little brown spot has been on the outer side of the right iris as long as the patient can remember. It seemed to grow about seven years ago, especially during the past two years. There have been attacks of blurring in this eye for the past three years, more frequently recently. The attacks vary from a few minutes to two hours. Vision $\frac{20}{40}$. The iris of the right eye shows a tumor extending from the base to just below the center of the cornea, presenting one reddish spot and several vessels. It measures 10 by 8*mm*. The fundus is normal. All tests are negative.

The doctor wishes to raise the question of treatment. He is of the opinion that in the first case it would be well to watch the tumor for any increase, then an iridectomy should be done. As the tumor in the second case has advanced so far, an enuncleation of the eyeball should be done.

DISCUSSION: DR. H. H. TYSON said that he had presented a patient with tumor of the iris to the section about fifteen years ago, a young man with normal vision. A small tumor about the size of a large pinhead was present in the lower portion of his iris, which did not yield to anti-luetic or other constitutional treatment. He was kept under observation for some time and an apparent slight increase in size followed. Enucleation was advised and concurred in by all who had examined the eye. Finally enucleation was performed and microscopic examination proved it to be a leucosarcoma which involved the posterior layers of the iris extensively and extended into ligamentum pectinatum, although showing macroscopically only a slight involvement of the anterior layers of iris. The patient is still alive and in good health. He considered Dr. Broughton's case as a leucosarcoma of iris and advised enucleation, provided no improvement followed the usual internal medication, X-ray or radium. He considered attempted removal by iridectomy as poor surgery.

DR. VANDEGRIFT said that he had a case similar to Dr. Broughton's first case. Removal showed this to be an endothelioma and after operation the tumor grew rapidly and the eyeball had to be enucleated.

DR. WEIDLER had seen a patient like Dr. Broughton's first case. An iridectomy was performed, showed it to be melanosarcoma and there was no recurrence in 3 years. He advised the tuberculin test in the first case and then iridectomy and microscopic examination. In the second case he advised iridectomy and the examination of a piece of tissue before enucleation.

DR. MITTENDORF advised enucleation in the second case, due to recent rapid growth. He advised iridectomy in the first case.

DR. CRIGLER said that in view of the fact that intraocular sarcomata were prone to extend by metastases, even before they perforate the coats of the eye, the eye should be sacrificed as soon as positive diagnosis was made.

DR. BROUGHTON in closing the discussion said: In the first case the mass does not seem to be attached to the cornea. He thinks this case should be let alone until he sees increase in size. In the second case, he believes the tumor started as a benign growth but is now probably malignant. He said that Dr. Knapp advised radium treatment before enucleation.

Dr. F. N. Irwin presented a patient with **buphthalmos.**

W. B. W., Jr., was first seen on Nov. 29, 1916, when he was twenty-two months old. His right eye was apparently normal. The left eye was enlarged, the sclera thinned, the anterior chamber deep, the iris was not tremulous, the tension was about +1 and the cornea steamy. The optic nerve head was difficult to see, but seemed white, the pupil reacted to light. A few days later Elliott's trephining operation was done at the superior sclero-corneal margin, combined with a partial iridectomy. There was little or no reaction following the operation, drainage was demonstrated, the cornea became clear and the tension normal. On January 20, 1921, the tonometer reading was normal. The eye had not grown larger since the operation. Filtration still active, the nerve head white, cupping about 3 D. Vision $\frac{20}{100}$.

Discussion: Dr. Emerson said that he had trephined a similar case with bilateral hydrophthalmos. The patient did well one year, then contracted pneumonia and died.

Dr. Wolff has a child at the Mt. Sinai Dispensary, whose one eye was operated upon elsewhere and lost; the second eye was kept soft for 6 years and vision maintained by constant use of miotics.

Dr. Cohen had a patient where one eye was enucleated for unilateral hydrophthalmos.

Dr. McDannald said that he had had a patient, first seen at nine days, with bilateral hydrophthalmos. At about two years of age both eyes were trephined. The cornea of one eye has remained practically normal in size, whereas the other is markedly stretched. There is tension in both eyes with cupping of the disks. The child has sufficient vision to orient itself and pick up objects. He also operated upon another case at about one year of age which passed from under his observation. The eye after trephine became very soft.

Dr. D. H. Webster presented a case of **hypophyseal tumor** in a patient, R. W., colored, 45 years old, who was seen on December 29, 1920, stating that four years ago the sight in the right eye had been lost at a time when she suffered from a nervous breakdown, with headache, sleeplessness, and confused vision, in a hospital in Virginia. The diagnosis of a tumor of the hypophysis was then made. She became much stouter, but showed no enlargement of the joints or changes in the hair distribution. At present the right eye is blind. Left $\frac{20}{50}$; field, temporal hemianopsia. Right disk atrophy; left beginning atrophy. Blood and spinal fluid negative.

X-ray report by Dr. Law: The sella is shallow but clearly defined, the posterior clinoid processes almost completely obliterated. Over the pituitary gland slightly to the right of the median line is an opaque mass the size of a small pea. This is on the floor of the fourth ventricle and is calcareous in nature. The case seems to be a superimposed tumor over the sella.

Discussion: Dr. Weidler spoke of a patient whom he had seen at the Neurological Institute and who was operated on by the transphenoidal route. Three operations had been performed. To-day, after six years, the right eye is blind, the left is $\frac{20}{30}$ with a temporal defect in the field. He believes that Dr. Webster's patient should be operated on.

Dr. King said that he had a patient in his service at Fox Hills, who had marked increase of intracranial pressure with ophthalmological symptoms, and signs similar to those of Dr. Webster's case. He had previously had a right-sided decompression, at the site of which was a large herniation of the brain. Afterwards he rapidly became blind in his right eye, with marked loss of vision in the left. In view of the fact that no localizing symptoms of a tumor were shown, a left-sided decompression was done to relieve the pressure and to prevent further loss of vision. The patient died several weeks later. Autopsy revealed a large encapsulated tumor of the right frontal lobe which obliterated the anterior horn of the right ventricle. This tumor could have readily been removed had its location been determined. Ventriculography would have been of much value in the case; perhaps it might be of value in Dr. Webster's case. Dr. King believes this is probably a hypophyseal tumor, but needs further study. If it is a cyst the trans-sphenoidal route is to be preferred; if it is a tumor the major portion of which is suprasellar, the choice of operation is the operation described by Dr. Heuer in a recent article, *i. e.*, by the frontal route, after having turned down a large bone flap.

Dr. W. M. Leszynsky said that he had never seen or heard of an X-ray demonstration of a tumor of the hypophysis. Sufficient data had not been presented in this case to warrant diagnosis of hypophyseal disease. It is probable that the involvement of the optic nerves is the result of pressure upon the chiasm by a localized basal meningitis or by distention of the third ventricle.

Dr. Broughton has seen several hypophyseal tumors. In the last case there was loss of vision in one eye and temporal hemianopsia in the other eye. One patient showed no increase for years under glandular extracts. His operative cases have been unsuccessful.

MEETING OF DECEMBER 20, 1920. DR. L. W. CRIGLER, CHAIRMAN.

The paper of the evening was read by **Dr. George E. de Schweinitz** of Philadelphia, "Concerning Ocular Conditions in Pituitary Body Disease in Syphilitic Subjects" (appears on page 203 of this issue).

Discussion: Dr. Charles H. Frazier of Philadelphia spoke on the surgical aspect of the subject (published in full on page 217 of this issue).

Dr. John E. Weeks. The title of Dr. de Schweinitz's paper leaves one in doubt as to whether he refers to syphilitic invasion of the pituitary body, or whether he refers to disease of the pituitary body of a non-specific nature, occurring in the syphilitic subject, or both. While it is conceivable that a non-specific pathological condition of the pituitary body may develop in the syphilitic subject, it is scarcely conceivable that this would occur except in very rare instances, and, if it did occur, it would be difficult to differentiate it from syphilis of the pituitary body, except in cases of tuberculosis of the pituitary body.

In syphilitic subjects the involvement of the pituitary body without gummatous involvement of the chiasm and adjacent structures is extremely rare.

Thus Gehrung (*N. Y. Eye and Ear Infirmary Reports*, 1904) in his report of 102 cases of disease of the chiasm, of which syphilis was the cause in nineteen, eleven coming to autopsy, mentions only one case in which the pituitary body was involved (Dr. Palerme, *Cong. Internat. d'Opht.*, Paris, 1867), and in this the chiasm was also involved.

That involvement of the pituitary body without marked involvement of the adjacent structures does sometimes occur is evidenced by the case of Cushing (*The Pituitary Body and its Diseases*, p. 263) and by cases reported here this evening. The development of syphilitic involvement of the structures at the base of the brain may occur at any time after the third or fourth year after the occurrence of the primary sore. The symptoms of syphilitic involvement of the pituitary body must in the large percentage of cases be combined with symptoms of interstitial involvement of the chiasm and surrounding structures. They will be devoid of all trophic pituitary disturbances, except perhaps those due to hypopituitarism which may develop in the later stages of the involvement. Thus we may look for symptoms evolved purely by pressure on the chiasm and also for the symptoms due to infiltration of and pressure on adjacent tissues. In disease confined to the pituitary body producing enlargement and pressure on the chiasm and tracts we would expect the development of bitemporal hemianopsia, symmetrical or not, depending on the parts pressed upon, with variations in the fields corresponding with variations in the pressure, and there would be the possibility of recovery of much of the affected portion of the field by relief of the pressure by any form of treatment, and the development of the process would be unaccompanied by extensive paralysis of adjacent nerve trunks.

The reason for the variation of fields and the possibility of restoration of fields after relief of pressure is admirably demonstrated by the research of Walker and Cushing reported in the ARCHIVES OF OPHTHALMOLOGY, v. xiv., p. 407, under the title "Optic Nerve Atrophy, Associated with Chiasmal Lesions," in which they show that destruction of tissues by pressure does not take place until long after function is suspended. The symptoms which accompany the infiltration of adjacent tissue are manifold. They will include isolated scotomata, a mild or severe form of optic neuritis, paresis or paralysis of adjacent nerves, etc., these signs not infrequently preceding the typical effect on the visual fields, which is due to pressure on the chiasm. When symptoms pointing to pituitary body disease are present, ophthalmologists at the present time resort to the X-ray to determine the condition of the osseous structures at and in the region of the sella, and also, I think, in by far the greater number of cases to the Wassermann or Noguchi or luetic test of blood and spinal fluid, or all of these, to establish the presence of or to exclude syphilis. If syphilis is present and also in many cases in which these tests do not demonstrate the presence of syphilis, intensive antisyphilitic treatment may be given.

In regard to the proper treatment to be given, there is evidence that salvarsan is not efficient in some cases (Ischreyt, G., *Arch. f. Augenheilk.*, vol. xxv., p. 72) in which mercurial inunctions are successful. There are some cases in which neither salvarsan nor mercury were successful (Pfister, F., *Wis. Med. Journal* vol. ii., No. 12). Spanbok and Steinhaus (*Annal d'Oculist.*, vol. cxv., 1896) report a case in which recovery took place by the use of large doses of iodide of potassium and deep parenchymatous injections of sozoiodolate of mercury.

It is probable that all of the various antisyphilitic remedies and methods of treatment may require trial before the best suited for the case in hand may be found.

Since a favorable outcome of treatment in hypophyseal and chiasm disease is so rarely attained in any but syphilitic cases, it is desirable that the possibility of syphilis as a factor should be eliminated, not only by the reactions of blood and spinal fluid, but also by the effect of intensive antispecific treatment tried over a limited period of time.

DR. CHARLES L. DANA said that the experience of neurologists had heretofore been, that the hypophysis was rarely involved by syphilitic lesions.

In his personal experience, for example, none of his cases of acromegaly or giantism had been syphilitic. Even meningeal syphilis at the base did not often affect the hypophysis in a way to produce obvious defects. Dr. de Schweinitz's experience really was in the same line: His cases showed that when syphilis did attack the hypophysis, it seemed to affect more the posterior lobe.

With regard to the results of using radium and X-ray in tumors of the hypophysis, he thought the question of the relative safety of the two should be considered; and he called attention to the fact that more definite results were now being obtained through the use of very massive doses. It is possible that, with such doses, effects may be secured without any operation.

Dr. Walter Timme, from the viewpoint of endocrinology, said that in his experience luetics, with central nervous system infection, showed signs of dispituitarism. He thought it was most difficult to say whether the pituitary body per se is or is not involved in syphilis, but that syphilitic subjects should be treated in addition for their endocrine dyscrasia. He pointed out that thyroid activity is dependent on the iodine content of the body, and that when we administer heavy metals, for example mercury, arsenic, and lead, which combine with iodine, we lower the activity of the thyroid. We should, therefore, administer iodine and thyroid when we prescribe heavy metals. This is the reason for Dr. de Schweinitz's observation that thyroid administration enhances the effect of the specific treatment. He had seen two patients with disease of the pituitary who were also syphilitic. The first patient showed signs of hypopituitarism, was morally delinquent, stole, lied, and went around promiscuously. She acquired syphilis which she gave to her husband and three children. Her examination revealed bi-temporal quadrantal disturbance of the visual fields, ptosis of the left eyelid, enophthalmos, and the X-ray plates revealed erosion of the posterior clinoid processes. She complained of severe intra-temporal headaches, more marked on the left side. The use of thyroid and pituitary alone did not relieve her symptoms, but the combination of arsenic, iodides, mercury, and thyroid soon relieved her. The second case which he reported belonged to Dr. de Schweinitz, group 3. Her father died, presumably of paresis, and she complained of periodic intra-temporal headaches. Dr. Krug found bi-temporal contraction of the visual fields, the posterior clinoid processes were eroded, both disks were choked, there was slight unilateral ptosis, and paralysis of the recti. The knee jerks were absent and the pupils were sluggish, and lightning-like pains were present in both legs—

seemingly a beginning tabes. This patient improved on the iodides and some pituitary and he believes that organo-therapy is of value in these cases. He stated that the hypophysis shows signs of productive inflammation in lethargic encephalitis and that the lethargy was caused by involvement of the hypophysis. He counseled caution in making diagnosis of gummatous involvement of the hypophysis, without lethargy, and stated his belief that lethargy would be found to be one of the pathognomic signs of syphilis of the pituitary body. He deprecated the pessimism evinced by Dr. Frazier of the efficiency of organo-therapy in pituitary disease, for in his experience many patients were relieved by such treatment.

DR. LUTHER C. PETER of Philadelphia (by invitation) spoke of the tendency to altitudinal hemianopsia especially for red and green as an early evidence of hypophyseal disease. He believes the fields are of great value in following the course and noting the results of treatment. When the question of operation is being considered the fields furnish valuable data in reaching a conclusion. He mentioned the interesting fact that Dr. Herman Knapp, more than fifty years ago, reported a case of hypophyseal disease similar to the one which Dr. de Schweinitz had reported in the second group in which the symptoms improved under anti-luetic treatment.

Dr. W. M. Leszynsky said that over forty years ago, it was well known that syphilitic gummatous infiltration frequently affected the pial structures at the base of the brain, often showing a special predilection for the interpeduncular space and the neighborhood of the optic chiasm.

This condition was well-established by the late Prof. Oppenheim in an article which I now recall, giving an elaborate report of a series of cases with perimetric charts, showing bi-temporal hemianopsia and various quadrantic defects. The illustrations further showed that under active anti-syphilitic treatment, the fields gradually became perfectly normal. Some of these cases were later verified by autopsy.

I do not believe that the diagnosis of syphilis of the hypophysis can be made from ophthalmological findings, without associated symptoms indicating hypophyseal dysfunction.

Dr. de Schweinitz, in closing the discussion, said that the difficulty of deciding whether the hypophysis was primarily or secondarily involved in syphilitic subjects was well known, and he had referred to this in his paper. Dr. Timme's statement, therefore, that in the presence of a direct syphilitic involvement of the gland by a gumma, for example, lethargy was a noteworthy feature was of the highest interest. One of his patients (Case 2 in the paper), the patient who probably had a gumma of the hypophysis, while not truly lethargic, had changed from a "rather gay person" to one who was subdued and altogether lacking his former buoyancy. As Dr. Peter had pointed out, the fields of vision of many of the subjects of pituitary body disorder interpret chiasmal involvement or pressure, and in that sense are characteristic. The changing character of the fields, and in some cases the scotomas, are also of noteworthy significance. But, while it may be too much to say that the alterations observed in ophthalmoscopic examination are ever pathognomonic, certainly the nerve-head changes in pituitary body disorders are often highly important. The peculiar waxy color of the disk, sometimes with a yellowish tint, is highly significant, as is well known. Careful fundus examination should never be neglected. Dr. de Schweinitz was much interested in Dr. Timme's endorsement of treatment by means of organotherapy combined with mercury, and in his explanation of the physiologic action of these remedies in these circumstances.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by Drs. A. N. ALLING, New Haven; M. J. SCHOENBERG, New York; T. H. BUTLER, London; P. J. DOYNE, London; and K. WESSELY (*Archiv für Augenheilkunde*), Würzburg.

Edited by MATTHIAS LANCKTON FOSTER, M.D., F.A.C.S.,
New Rochelle, N. Y.

I.—GENERAL OPHTHALMIC LITERATURE.

1. SEWALL, H. **Some optical imperfections of the eye and some of their uses.** *American Journal of Ophthalmology*, December, 1920.
2. WUERDEMANN, H. V. **Hereditary reversion pigmentation of the eyelids with heterochromia of the iris.** *Ibid.*, December, 1920.

SEWALL (1, **Some optical imperfections of the eye**) calls attention to an interesting experiment which demonstrates the fact that light which passes through the sclera, being red when it reaches the interior, stimulates and fatigues the red elements so that light entering through the pupil produces sensations of green by exciting the rested green elements. This phenomenon may be observed if a lamp be held so that it shines into only one eye from the side. A piece of white paper will seem to be pale green with the illuminated eye and red with the other. He thinks that the acuity of vision is increased when light enters through the sclera, as the sensitiveness of the retina is said to be greater for green than for red.

ALLING.

WUERDEMANN'S (2, **Hereditary reversion pigmentation of the eyelids with heterochromia of the iris**) cases showed evidences of negro blood in a dark complexion, kinky hair, and absence of the meniscus of the finger nails. A peculiar bluish discoloration of the left eyelid he regards as evidence of a reversion to a remote negro ancestor. ALLING.

II.—THE EYE IN ITS RELATIONS TO GENERAL DISEASE.

3. Abelsdorf. **Transient blindness with paresis of the ocular muscles after poisoning with carbonic oxide.** *Deutsche med. Wochensch.*, 1920, p. 210.

4. Adams. **Arteriosclerosis and the eye.** *British Journal of Ophthalmology*, July, 1920.

5. Arnold. **Optic neuritis a late symptom in typhus.** *Wien. klin. Wochenschr.*, 1919, No. 36.

6. Benedict, W. L. **Early diagnosis of pituitary tumor with ocular phenomena.** *American Journal of Ophthalmology*, August, 1920.

7. Hirsch. **Eye symptoms in tumors of the hypophysis.** *Zeitschr. f. Augenheilkunde*, Bd. 42, p. 257.

8. Holmes, Gordon. **Disturbances of vision by cerebral lesions.** *British Journal of Ophthalmology*, July, 1920.

9. Leichtnam, Else. **Multiple sclerosis with long interval.** *Deutsche Zeitschr. f. Nervenheilk.*, Bd. 64, 1919.

10. Lutz. **Eye symptoms of pseudo-tumor of the brain, with report of a case.** *Zeitschr. f. Augenheilk.*, Bd. 42, p. 165.

11. Moore, Foster. **Exophthalmos and the limitation of the eye movements in Graves's disease.** *Lancet*, October, 1920.

12. Nathan. **Ocular affections in botulismus.** *Diss.*, Breslau, 1919.

13. Ruttin. **Aneurysm of the carotid in the cavernous sinus with murmur to be heard over the head.** *Zeitschr. f. Augenheilk.*, xlii., p. 263.

14. Schanz. **Effects of light in toxic amblyopia.** *Muench. med. Wochensch.*, 1920, p. 359.

15. Wunderlich. **Quinine poisoning and its pathogenesis, with report of a case.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., p. 270.

The patient observed by Lutz (10, **Eye symptoms of pseudo-tumor of the brain**) suddenly exhibited choked disk, headache, dizziness, and vomiting with no signs of meningitis and no rise of temperature. The symptoms gradually retrogressed, and after four weeks the patient had recovered. The next year he developed a nervous deafness on one side, a year later loss of vestibular function on the same side and unilateral Romberg. Fits occurred from time to time, which were ascribed to a lesion in the angle between the cerebellum and the pons on the left side. Although her first husband had been treated for syphilis, and she herself had a positive blood Wassermann, Lutz thinks syphilis can be excluded as the cause, because the only treatment which brought about a comparatively good result was iodine in large doses.

This lecture is a special plea for the recognition of the position of the ophthalmic surgeon in the early diagnosis of high blood tension and arteriosclerosis. ADAMS (4, **Arteriosclerosis and the eye**) points out that it is the privilege of the ophthalmic surgeon to examine many patients between the ages of 45 and 55, when the symptoms of presbyopia arise, and that this is the age in which high blood tension manifestations first make their appearance, the early recognition and treatment of which are so very important. Therefore if it is possible by ophthalmoscopic examination to recognize early conditions of high blood tension, a heavy responsibility rests upon the ophthalmic surgeon. He further points out that many symptoms, such as headache and giddiness, are attributed by the lay public to the eyes and an ophthalmic surgeon is consulted, whereas high blood tension is at the root of the trouble.

The lecture starts with a classification of the various stages of arteriosclerosis, namely:

1. HYPERPIESIA. This is characterized by simple high tension, without signs of vascular or renal disease.
2. ARTERIOSCLEROSIS. Associated with high tension, renal and cardiac changes.
3. CHRONIC NEPHRITIS. With secondary high tension, arteriosclerosis, and cardiac changes.

The first group is in many respects the most important in the present connection as the condition, if recognized, is amenable to treatment.

With regard to symptoms Adams lays especial emphasis on the headache in the early morning, which may even wake the patient up, on the pain in the back of the neck, and on giddiness, especially that giddiness which comes on change of position. These symptoms, occurring in elderly patients, are to Adams very suggestive of high tension.

With regard to the ophthalmoscopic appearances in these cases, he quotes the four points which Bardsley considers are characteristic of simple high tension, namely: (1) appearance of uniform distension of vessels; (2) broadening of the light streak on the arteries; (3) the increased brilliancy of the said light streak; (4) the indentation of the veins by the arteries.

Adams, while recognizing the value of Bardsley's observations, does not find them universally true. He would lay stress on the small size and pale color of the arteries in this condition and further, where an artery crosses a vein, on the absence of the light reflex for some short distance up and down the vein, due he supposes to some flattening of the curvature with consequent alteration of the light reflex.

With regard to the second group—arteriosclerosis—Adams outlines the work of Marcus Gunn, de Schweinitz, and Foster Moore. He considers the following points of the most constant importance: 1. Irregularity of the caliber of the arteries associated with a general diminution in their size. 2. Loss of translucency of the arterial wall. 3. Where the artery crosses a vein, the vein is frequently pushed out of its direct course, there is a loss of the light reflex from the vein for a varying distance up and down from the arterial crossing, the vein appears to be pinched or indented, and the appearance of "banking" of the blood on the distal side of the crossing is not a usual occurrence. 4. The condition of arteriosclerotic retinitis, described by Foster Moore, which consists of small scattered white spots, irregularly circular in outline, consisting of retinal exudate without œdema or pigmentary disturbance and situated commonly between the macula and the disk and sometimes associated with a partial star-shaped figure at the macula.

From an investigation of cases of arteriosclerosis Adams found gross changes in the retinal vessels in at least 50 per cent. of the cases and he quotes the figures of other authorities which confirm his own statistics.

With regard to group 3, where the disease is primarily renal, he points that the patients are usually younger and not so vigorous as in the arteriosclerotic group, that the urine differs, having a higher albumin content, and that the blood tension is more variable. The "cotton wool" patches of exudate in the retina are more usually associated with this group of cases and the vascular changes may be less marked.

In considering the prognosis Adams lays emphasis on the point that high blood tension is a compensatory state and that the condition of the associated viscera, especially the heart and kidneys, will be the surest guide to the future. In general he would say that the younger the patient, the worse the prognosis, particularly so if albumin is present in the urine.

Adams next describes an instrument devised by Thomson Henderson for measuring the arterial diastolic pressure in the eye. It is applied to the eye through the upper lid. As the intraocular fluid contents must lie at venous exit pressure, so if the intraocular pressure is raised the venous exit pressure is also; and raised to the same level, and as the pressure is still further increased, it rises first to arterial diastolic and finally to arterial systolic pressure when the circulation will cease. Sufficient readings have not yet been taken, though Bailliart, with a slightly modified instrument, found the normal tension of the eye to be 18*mm* Hg, diastolic pressure to be 25*mm* Hg, systolic pressure to be 50*mm* Hg. These figures are much lower than those of Priestly Smith. Further work on these lines seems to be indicated.

P. G. DOYNE.

In this paper GORDON HOLMES (8, **Disturbances of vision by cerebral lesions**) first refers to certain conclusions which he, in association with Colonel Lister, had brought forward some months previously. These conclusions were:

1. The upper half of each retina is represented in the dorsal, and the lower in the ventral part of each visual area.

2. The center for macular vision lies in the posterior extremities of the visual areas, and has not a bilateral representation.

3. The center for vision for the periphery of the retina is probably situated in the anterior ends of the visual areas, and the serial concentric zones of the retina from the macula to the periphery are probably represented in this order from behind forwards in the visual cortex.

He then proceeds to support and amplify these conclusions by quoting a series of cases which he has observed. Most of his material comes from the base hospitals in France and is fully illustrated with charts of the fields of vision and diagrams of the situations of the wounds.

He discusses central and paracentral scotomata, sector scotomata, the cortical representation of peripheral vision, and the visual defects due to lesions of the optic radiations. Regarding the latter he points out that the defects in the fields are frequently quadrantic and suggests that it is likely that the fibers of the radiations may be arranged in laminæ or series according to the origin of the impulses they carry.

In the early stages after a wound of the head it was usual to find a much larger area of visual loss than was established at a later period, and it was noted that recovery took place sometimes from the center to the periphery and at other times from the periphery to the center. In Holmes's opinion the permanent visual loss is due to definite cortical destruction and that part which recovers is due to local cerebral concussion,—œdematous swelling—and that this underlying principle determines the nature of the recovery.

It has been held by some that occipital injuries may produce a dissociation of visual perceptions, *e.g.*, light, shape, movement, and color; this Holmes thinks is improbable. Different parts of the retina are specialized for various functions and it would be likely that the special function would be the first to reappear, thus it would be reasonable to expect that the peripheral retina should appreciate movement before shape or color. Similarly, in regard to color, there may be areas where only a white object is appreciated but it will usually be found that the visual sensibility to white is also lowered.

Holmes contends that the three conclusions, mentioned at the beginning of his paper, are confirmed by the evidence which he has produced and that they can be regarded, if not as final, at any rate as working hypotheses for further investigations.

He adds three further conclusions:

1. Those portions of the retina adjoining their vertical axes are probably represented in the dorsal and ventral margins of the visual areas, while the retina in the neighborhood of its horizontal axis is projected on to the walls and floor of the calcarine fissures.

(This is shown very clearly in a diagram.)

2. Severe lesions of the visual cortex produce complete blindness in the corresponding portions of the visual fields, or if incomplete an amblyopia, color vision being generally lost and white objects appearing indistinct, or only more potent stimuli, as abruptly moving objects, may excite sensations.

3. The defects of vision in the fields of the two eyes are always congruous and superimposable, provided that no abnormality of the peripheral visual apparatus exists.

P. G. DOYNE.

HIRSCH (7, **Eye symptoms in tumors of the hypophysis**) reports observations on fifty-nine patients in whom the diagnosis of tumor of the hypophysis had been confirmed by operation. The eye disturbances are due to the strangulation of the chiasm by the arteries of the Circle of Willis. In forty-four cases without acromegaly, of which thirty-four were adenomata, the disturbances were all of the direct vision. Similar symptoms were present with acromegaly, but fifty per cent. without any visual disturbance. In addition to these there were three cases in which the diagnosis of tumor of the hypophysis was proved wrong by operation; three of these had choked disk.

In a very arteriosclerotic woman, 73 years old, RUTTIN (13, **Aneurysm of the carotid artery in the cavernous sinus**) observed, within four months after the onset of a paresis of the abducens, the development of exophthalmos, engorgement of the external and retinal veins, hemorrhages on the papilla, and increase of tension to 60*mm* Hg. Over the entire head, but especially over the left temporal region, could be heard a loud murmur, synchronous with the carotid pulse, which disappeared when the left carotid was compressed.

Among 244 typhus patients ARNOLD (5, **Optic neuritis a late symptom in typhus**) found optic neuritis to appear as a late symptom in fifty-nine per cent. of the cases. It is usually distinct on the tenth or twelfth day, at a time when confusion with typhoid is particularly possible because the fever is going down by lysis and the exanthem has more or less completely disappeared. The optic neuritis also runs parallel in time to the appearance of the positive hæmolysin reaction in the cerebrospinal fluid. The prognosis is good.

LEICHTNAM (9, **Multiple sclerosis with long interval**) reports a case which presented a retrobulbar neuritis. Twelve years before such a retrobulbar neuritis had appeared as an initial symptom, but at that time the diagnosis of multiple sclerosis could not be made. During the interval the vision had been good and the central scotoma had disappeared.

NATHAN (12, **Ocular affections in botulismus**) gives the clinical histories of twenty-eight cases of botulismus with special reference to the eye symptoms. Paresis of the accommodation was most common, with pupillary disturbances, usually due to paresis of the sphincter varying in degree, almost equally frequent. Less commonly the external muscles of the eye are affected, chiefly the levator palpebræ and the abducens. Other observations are more or less isolated. Differentiation from post-diphtheritic paresis of the accommodation through the pupillary movement remaining intact.

In ABELSDORF'S (3, **Transient blindness with paresis of the ocular muscles after carbonic oxide poisoning**) case there remained only small portions of the visual fields, central in the right, excentric in the left, in which movements of the hand could be distinguished at the distance of a meter. There was anisocoria with preservation of the pupillary reactions. As vision improved, there was no central scotoma, a paresis of the left inferior rectus appeared. In less than five weeks both eyes had regained full vision and the visual fields were normal, while the muscular paresis had extended. The writer thinks that an acute, quickly retrogressing, bilateral orbital or intracranial neuritis may have produced the disturbance of the visual fields, especially as slight symptoms of neuritis were to be found ophthalmoscopically in other like cases.

WUNDERLICH'S (15, **Quinine poisoning**) patient took eight grams of quinine for the purpose of producing an abortion. Aside from the general symptoms and deafness, amaurosis was present from the second to the fourth day, the pupils being widely dilated with reaction to light and convergence. The lower margin of the left papilla was slightly hazy with an adjoining slight haziness of the retina; the condition of the left papilla was similar, but less marked. The vessels were normal. The right field of vision, the only one taken, showed a concentric contraction. Hemeralopia was present. In the course of time the vision improved, but pathological changes in the fundus continually increased. The vessels became small and the papilla paler until at the end of three weeks it was as white as porcelain. Some months later the papilla was somewhat more reddish and the vessels less small; the mydriasis and hemeralopia persisted. The writer discusses the literature on the subject and finally concludes that quinine injures primarily the nervous elements of the eye, perhaps the central ganglia also, irritates the sympathetic, and primarily impairs the musculature of the vessels. The action of optochin is analogous to that of quinine.

A number of substances which are quite different chemically, such as optochin, methyl alcohol, quinine, filix, dinitrobenzol, and atoxyl, produce visual disturbances which have certain similarities.

Experimental researches have established, contrary to former views, that the primary injury is not to the optic nerves, but to the layer of ganglion cells of the retina. SCHANZ (14, **Effects of light in toxic amblyopia**) thinks that this layer of the retina lying next to the vitreous is injured by light, the poisonous substances acting only as sensitizing agents. When the fundus is lighted uniformly the central portion has a better chance for recovery than the peripheral, because of its better nutritive supply, while if the central area receives the greater part of the light it suffers the more; thus producing in the one case a concentric contraction, and in the other a central scotoma.

The causes of the exophthalmos in this condition have been attributed to:

1. Irritation of the sympathetic producing a contraction of the unstriped muscle tissue in the orbit.
2. Engorgement of the orbit with blood.
3. Increase of the orbital fat.

FOSTER MOORE (11, **Exophthalmos and the limitation of the eye movements in Graves's disease**) favors the third cause and cites two cases in support of it. The first case was that of a woman of forty-five years of age who died of Graves's disease. She had marked exophthalmos of one eye and at the autopsy this condition persisted. Examination of the orbit showed nothing abnormal except a marked excess of fat in the cavity.

In the second case there was exophthalmos of both eyes, but to such an extreme extent in the left eye that it was necessary to attempt to suture the lids in order to save the eye. On the operation table it was found to be impossible to approximate the two lids, as a consequence therefore an incision was made along the whole length of the inferior fornix and the orbital cavity exposed, then with forceps a large amount of the orbital fat was picked away and after this procedure the lids were easily made to meet.

Nothing abnormal was seen or felt in the orbit, but the fat seemed to be very œdematous and the bellies of the recti muscles, which were exposed, appeared to be swollen and fusiform in shape.

Foster Moore suggests that this condition of the recti muscles may account for the limitation of ocular movements which often occurs in these cases. P. G. DOYNE.

BENEDICT (6, **Early diagnosis of pituitary tumor with ocular phenomena**) reports the study of 32 cases from the Mayo clinic. The ocular phenomena were failing vision, affection of the field, and atrophy of the nerve. The visual acuity as a rule fails very slowly. Aside from a peripheral contraction the cases fall into three groups, those with bitemporal hemianopsia, those with homonymous hemianopsia, and those with no light perception in one eye and a temporal defect in the other. A decompression operation on the side of the head or at the sella, will often improve temporarily the vision and the fields. There should be a close relationship between the ophthalmologist, neurologist, and surgeon. Pallor of the disks with changes in the fields should always cause suspicion, and operation should be considered before atrophy has progressed beyond the possibility of restoration of vision. ALLING.

III.—OCULAR DISEASES, REMEDIES, AND INSTRUMENTS.

16. BAILLART, P. **The sphygmomanometric value of recording the oscillations of the tonometric needle during its application to the eyeball.** *Annales d'oculistique*, cliv., 2.
17. BARDSLEY, P. C. **A new form of bifocal lens.** *British Journal of Ophthalmology*, March, 1919.
18. CHEVALIER. **A contribution to the study of collargol applied in ophthalmology.** *La clinique ophthalmologique*, viii., 5.
19. CLAPP, C. A. **Use of mercurochrome-220 as a germicide in ophthalmia neonatorum.** *Journal A. M. A.*, May 1, 1920.
20. DARIER, A. **Parenteral injections of cow's milk.** *Ibid.*, viii., 3.
21. DIANOUX. **Aspirin in syphilitic iritis.** *Ibid.*, viii., 3.
22. FRANKLIN, W. S., and CORDES, F. C. **Radium for cataract?** *American Journal of Ophthalmology*, September, 1920.
23. GAUPILLAT. **Eye diseases treated with cow's milk.** *Ibid.*, 2.
24. GROS, H., and FROMAGET. **The analgesic action of a weak faradic current in ocular therapeutics.** *Ibid.*, viii., 1.
25. HENSEN. **The effect produced by Ponndorf's cutaneous inoculation of tuberculin on scrofulous and tuberculous diseases of the eye.** *Zeitschrift f. Augenheilkunde*, xlii., 4–5, p. 221.
26. HESSBERG. **Tuberculosis of the eye.** *Berl. klin. Wochenschr.*, No. 1.
27. HOWARD, H. J. **A test for the judgment of distance.** *American Journal of Ophthalmology*, September, 1919.

28. Johnson, J. A. **Experiments on rabbits with salvarsan. Therapeutic and toxic doses.** *Ibid.*, October, 1919.

29. Kraupa. **Results of treatment of tuberculous eye affections by partial antigens and injections of milk.** *Zeitschr. f. Augenheilk.*, xlii., p. 105.

30. New, G. B., and Benedict, W. L. **Radium in the treatment of the eye and adnexa.** *Ibid.*, April, 1920.

31. Pick. **Some consequences of the war in eye diseases.** *Deutsche med. Wochenschr.*, No. 2, p. 44.

32. Seefelder. **The influence of the war upon eye diseases at home.** *Wiener klin. Wochenschr.*, 1919, No. 52.

Pick (31, **Some consequences of the war in eye diseases**) compares 2000 eye diseases during 1913 with 2000 during 1919. The influence of the war is seen in the great increase of scrofulous and tuberculous diseases of the eye, and of toxic amblyopia due to abuse of tobacco and alcohol. The increase in the number of patients with scrofulous affections of the eye is fifty per cent., with incomparably more people past the twenties, among whom such clinical pictures formerly were not common. In many cases also the disease was uncommonly obstinate, with cases of unusual localization, as phlyctenules in the corneal epithelium, or in the palpebral conjunctiva. The drinking of raw milk was frequently the probable cause of the infection, especially in well nourished and strong patients. In some cases which were complicated by syphilis, an antisyphilitic treatment considerably hastened the healing of the scrofulous symptoms. Eighteen cases of toxic amblyopia were observed in 1919 as against one in 1913, and the cause was ascribed to "German tobacco." Pick believes that the under nutrition brought on during the war, with perhaps specially harmful substances in the improperly treated German tobacco, explains why toxic amblyopia is so frequent and severe. In measuring the central scotoma he could always demonstrate a connection between it and the blind spot.

Seefelder (32, **Influence of the war upon eye diseases at home**) finds that the eczematous and scrofulous diseases of the eye have increased about one hundred per cent. He also finds that the average course is more severe than formerly, and that adults are attacked with marked frequency. Less certain is the increase in the clinical pictures recognized as surely tuberculous. He has observed also a considerable increase in the gonorrheal ophthalmia of the new born, although it is no more frequent in adults than formerly. He thinks that the reason why syphilitic eye diseases do not show an increase yet is because years often elapse before they come to light. Trachoma shows no increase. This he ascribes to the lack of contact between the troops and the civilian population. Acute glaucoma has increased from seven per cent. in 1915 to twenty-one per cent. in 1918, but only in females. This he ascribes to the numberless emotional excitements, which are known to favor attacks of glaucoma. A surprising consequence of the war is the almost complete disappearance of keratomalacia, which he ascribes to the disappearance of farinaceous foods from the market and the consequently enforced breast feeding of infants. In neutral Holland, on the contrary, keratomalacia has increased. A considerable increase of toxic amblyopia is noted, mainly from tobacco favored by under nutrition, but also from methyl and denatured alcohol. No increase in botulismus and in cysticercus intraocularis was observed.

HESSBERG (26, **Tuberculosis of the eye**) confirms the statements of the two preceding writers concerning the great increase of ocular tuberculosis since the war, and the markedly slight tendency to healing in comparison with experience in former times.

HENSEN (25, **Effect produced by Ponndorf's cutaneous inoculation of tuberculin on scrofulous and tuberculous eye**) tested the therapeutic action of Ponndorf's cutaneous treatment with old tuberculin in over 300 cases, and found it ineffective for good. On the contrary he saw it cause harm. New corneal infiltrates appeared after the inoculation in eyes that previously were unirritated. In 65 per cent. of the cases there was a quick rise of fever, in some irregular and lasting for weeks, which he ascribed to focal reactions on the part of tuberculous lesions located elsewhere. Such a focal reaction in the lungs was fatal in one case. He concludes that the rubbing of tuberculin into from fifteen to twenty minute skin incisions introduces into the body an unknown quantity of the material while the rapidity with which it is taken up by the circulation is unknown and cannot be influenced, so that this method of treatment of tuberculous lesions is uncertain and frequently harmful.

KRAUPA (29, **Results of treatment of tuberculous eyes by**

partial antigens and injections of milk) reports his results in about a hundred cases of severe tuberculosis of the eye. In three of sclerosing keratitis with iritis the improvement was so rapid and marked that it seemed as though it must have resulted from the treatment, but the results in the rest left him uncertain as to the part played by the specific treatment. Simultaneous treatment with sunlight did good service, while diathermia proved to be of no special use. The results from injections of milk, tested on a hundred patients, were better. He ascribes the effect of these injections to the setting free in some unknown way of protective powers which are present.

DARIER (20, **Parenteral injections of cow's milk**) relates his experiences in a variety of eye cases, like parenchymatous keratitis, corneal ulcers, post operative or traumatic ocular infections of the cornea, iritis and iridocyclitis, ophthalmic herpes, eczema of the lids and confirms the favorable impression of other French authors. However, he believes that antidiphtheric serum used by mouth or as subcutaneous injections are superior both, as to results obtained and advantages of administration. The milk injections are usually painful; they produce general reactions (fever, chills, nausea, etc.), not observed after the oral or even intravenous injection of serum. But in grave cases it is worth while to use both methods, the serum and milk at the same time.

SCHOENBERG.

GAUPILLAT (23, **Eye diseases treated with cow's milk**) relates his results in several cases of hypopion keratitis, traumatic keratitis, serous iritis, interstitial keratitis, and chronic dacryocystitis, which responded very readily to subcutaneous injections of milk.

SCHOENBERG.

CHEVALIER (18, **A contribution to the study of collargol applied in ophthalmology**) says that collargol is best used as drops in 1–2 per cent. solution, 15 per cent. ointment (Crédé) for inunctions and as intravenous injection 3 to 5*cc* of a 1–2 per cent. solution. Cases of bleparitis, conjunctivitis, corneal ulcers, post-operative infections, and dacryocystitis treated with collargol with beneficial results are reported.

SCHOENBERG.

JOHNSON (28, **Experiments on rabbits with salvarsan**) subjected a number of rabbits to large doses of salvarsan and the examinations showed that the tissues were thoroughly infiltrated with arsenic. The dose of one decigram was lethal to but three. In none of the twelve rabbits was an optic neuritis produced. These observations taken in connection with the fact that 14 cases of optic neuritis either before or during antisyphilitic treatment, were rapidly cured by salvarsan, would seem to indicate that there is no fear of producing blindness by the therapeutic doses of the drug.

ALLING.

DIANOUX (21, **Aspirin in syphilitic iritis**) recommends the use of large doses. In one case he has seen a surprising improvement in less than twenty-four hours. He advises 3 grammes of aspirin given in one dose.

SCHOENBERG.

GROS and FROMAGET (24, **The analgesic action of a weak faradic current in ocular therapeutics**) have observed that the application of one of the poles of a weak faradic current upon the eyelid previously covered by a wet compress, while the other pole is held in the hand by the patient, is apt to relieve him in 3–5 minutes of pain in the eye of a considerable variety of causes. The authors have obtained relief of pain due to a herpetic eruption of the cornea, a subconjunctival injection of mercury cyanide, an acute kerato-iritis, a painful atrophic eye, superficial lesions of the cornea in a gassed soldier, absolute glaucoma.

The pole applied on the eye must have a large surface and the current very weak so as not to cause any unpleasant sensation. SCHOENBERG.

The oscillations of the Schiotz tonometer needle is known to everyone using this instrument. BAILLART (16, **The sphygmomanometric value of recording the oscillations of the tonometric needle during its application on the eyeball**) has succeeded in devising a procedure of obtaining a photographic record of these oscillations and believes that the study of such records may furnish valuable information regarding the report between the intraocular tension and intraocular arterial pressure. The papers reproduce a number of photo-tracings of the oscillatory movements of the tonometer needle.

SCHOENBERG.

BARDSLEY (17, **A new form of bifocal lens**) does not approve of the practice now almost universal of fully correcting myopia in children. He is himself a myope and always objected to reading with full correction, and early in life took to bifocals. These were at first of the ordinary type, but when he began to study ophthalmology he learned that in looking down through the wafer of ordinary bifocals considerable distortion was produced. As a matter of fact a sphere of 4 D. tilted 20° gives the effect of a cylinder of 0.5 D. To overcome this defect Bardsley angled the reading segment of his glasses. At first the reading portion was carried straight across, and the segments cemented together. This pattern blurs most of the lower temporal field for distance. The next step was to angle circular reading segments by grinding a meniscus curve ("Toric" in the text) on the upper lens and a double concave or convex on the lower. This type gave immense satisfaction and the inventor wore them for twenty years. These glasses are expensive, the dividing line is pronounced, dust settles on the line of union, and the lens is ugly. Mr. J. B. Rayner has now succeeded in grinding the angled lens in one piece. They are made from a blank "invisible bifocal." This is ground in front to give an angle of 15°–20° and the refracting curve is worked on behind.

T. HARRISON BUTLER.

HOWARD (27, **A test for the judgment of distance**) with an apparatus so constructed as to expose two rods placed at variable distances from the observer, has made tests of the ability to judge distance by means of the binocular parallax and has found a great difference in individuals. This factor is undoubtedly the most important of all those which are used in making our estimates as is shown by the fact that the binocular judgment is twenty times more accurate than the use of the size of the retinal image which is the principal factor in monocular vision. The one-eyed persons however are helped in other ways as by terrestrial associations and motion parallax so their ability is not so comparatively less. In binocular parallax the person with the greatest interpupillary distance has the greatest advantage. ALLING.

CLAPP (19, **Mercurochrome-220 as a germicide in ophthalmia neonatorum**) thinks from his experience with four cases that this new remedy acted well and apparently gave a rapid convalescence.

ALLING.

FRANKLIN and CORDES (22, **Radium for cataract?**) have exposed thirty-one patients to radium emanations and think that the treatment improved vision in eighty-four per cent. They advise frequent applications at the beginning and have seen no ill effects on the eye when the proper technic was followed.

ALLING.

NEW and BENEDICT (30, **Radium in the treatment of diseases of the eye and adnexa**) report upon 133 cases treated in the Mayo clinic. They were mostly angioma of the lids, basal-cell epithelioma and sarcoma of the orbit with a few cases of vernal catarrh, blastomycosis of the lids and epithelioma of the limbus. They regard radium as a specific in angioma. A small tube of radium is inserted into the center of the tumor and left for several hours. Most of the tumors disappeared without deformity in from three to four months. Squamous epitheliomata are usually of rapid growth and do not respond well to the treatment. They should be excised with the knife. Sarcomata of the orbit have been reduced in size or entirely eradicated but on account of their malignancy the patient usually dies of metastases.

ALLING.

IV.—ANATOMY, PHYSIOLOGY, MALFORMATIONS.

33. CASSIMATIS. **Coloboma of the iris and choroid.** *La clinique ophtolmologique*, viii., 3.

34. FEINGOLD, M. **Peripheral communicating vessels between the retina and the choroid. Fold of inner limiting membrane in chorioretinitis.** *American Journal of Ophthalmology*, July, 1920.

35. FINNOFF, W. C. **Anomalous condition of ocular fundus.** *American Journal of Ophthalmology*, March, 1920.

36. GIFFORD, S. R. **Atypical coloboma of the iris and choroid.** *Ibid.*, February, 1920.

37. HAGEN. **The regeneration of the aqueous in the human eye.** *Klin. Monatsbl. f. Augenheilkunde*, February–March, 1920.

38. KAYSER, B. **The proportionate size of the cornea and globe in megalocornea.** *Ibid.*, lxiv., p. 292.

39. KRAEMER. **A case of congenital bilateral ectopia of the lens.** *Ibid.*, p. 393.

40. Kraupa, E. **Episcleral loops of veins at the outer canthus, a congenital anomaly.** *Ibid.*, p. 324.

41. Middleton, A. B. **Congenital eye conditions affecting vision of two hundred thousand troops examined at Camp Travis.** *American Journal of Ophthalmology*, June, 1919.

42. Morax, V. **A discussion of the hypotheses regarding the maculo-cortical centers.** *Annales d'oculistique*, clvi., 1.

43. Wuerdemann, H. V. **The fundus of the eye after death.** *Ibid.*, May, 1920.

Kayser (38, **Proportionate size of the cornea and globe in megalocornea**) does not believe that the entire eyeball is enlarged in megalocornea, but believes that the enlargement of the cornea is independent of increase of size of the rest of the globe. An enlargement of the eyeball in proportion to the size of the cornea in excessive megalocornea would necessarily result in a considerable exophthalmos, but this has been observed in only a single case, that of Soriano, in which high myopia was present. The radius of curvature of the cornea is another evidence against an enlargement of the entire eye. Kayser believes that the anomaly is wholly situated in the anterior segment of the globe, and that Horner's designation of cornea globosa, or megalocornea globosa, is correct. He does not agree with Staehli that megalocornea is simply a variation in the size of the cornea.

A number of cases have been observed in which choroidal vessels entered into direct and visible communication with normal retinal vessels. In another group are cases in which no such connection exists, but the retinal vessels are obliterated and the circulation is supplied by vessels entering through a chorioretinal focus. Two cases described by Feingold (34, **Peripheral communicating vessels between the retina and the choroid**) belong to the latter group, and one partly to both groups. The cases present small patches of choroidal atrophy and a vein is seen to enter and entirely disappear, evidently being supplied by the choroidal circulation.

Alling.

Wuerdemann (43, **The fundus of the eye after death**) refers to the signs of death as shown in the eye. The paleness and partial opening of the lids; the falling in of the globes; insensibility of the conjunctiva and cornea; lethal discoloration of the sclera; usually dilated pupil, which is followed by contraction as rigor mortis sets in. He has had opportunity to study also the appearance of the background. He found that immediately after death the fundus takes on a yellowish discoloration which later turns to brownish gray. The nerve head blanches and the arteries become straighter and narrower, the blood entirely disappearing from the arteries, but may remain in the veins even for twenty-four hours.

ALLING.

MORAX (42, **Hypotheses regarding the maculo-cortical centers**) believes that the cortical center of the macula is located in the posterior pole of the occipital lobe, and that each macula in the retina is provided with fibers from both corticomacular centers. While he has no anatomical specimens to prove this hypothesis, he believes that this supposition explains better than any other the various types of hemianopsia reported by the author in conjunction with Moreau and Castelain.

SCHOENBERG.

Contrary to all results of animal experimentation HAGEN (37, **Regeneration of the aqueous**) claims that the regeneration of the aqueous in the human eye comes only from the vitreous and not as a new secretion from the ciliary processes. His conclusions are based on the refractometric examinations of aqueous collected from eyes from which it had escaped subsequent to either an operation or a perforating wound. In only one case of absolute inflammatory glaucoma was the anterior chamber punctured and later punctured again. Comparison of this with the others showed no material change due to admixture with the tears. He believes that in man the aqueous is regenerated wholly through transudation of the vitreous fluid, in the same way that it is known to take place in cadaveric eyes. Greef's blebs have never been found on the ciliary processes of the human eye, the tension remains low for a long time after the anterior chamber has been emptied, and this would explain the impermeability of the human ciliary processes for fluorescin. He considers that the theories concerning the change of fluid in the eye hitherto held are erroneous and should be revised by new researches.

KRAUPA (40, **Episcleral loops of veins at the outer canthus**) describes as a congenital anomaly loops of episcleral vessels which not so very rarely appear in the form of a triangle about the outer canthus, springing from and returning to the tissue of the external tarsal ligament. These loops extend more or less in the direction of the limbus, but do not anastomose with the other vessels of the globe or of the episclera.

KRAEMER (39, **Congenital bilateral ectopia of the lens**) reports a case in which both lenses were displaced downwards and inwards, inclined backwards, and so rotated about their vertical axes that the anterior surfaces looked outwards and upwards. Good vision was secured with strong plus lenses, as the entire pupillary areas were aphakic.

CASSIMATIS (33, **Coloboma of the iris and choroid**) describes the ophthalmoscopic appearances in a case of this nature.

SCHOENBERG.

According to GIFFORD (36, **Atypical coloboma of the iris and choroid**) his case is the only one on record in which an upward coloboma of both the iris and the choroid has occurred together. The explanation of these colobomata, atypically placed, is not very evident, but it is well established that secondary clefts are occasionally found in the optic vesicle in fetal life, and it is possible that the mesoderm, usually vascular, may push into these clefts and leave bands which would hinder the growth of the iris. ALLING.

FINNOFF (35, **Anomalous condition of ocular fundus**) discovered a veil-like membrane beginning at the disk, which was about one third covered, and running upward and slightly inward into the vitreous well forward of the equator. There was much pigment about the nerve, and some at the edge of the funnel-shaped mass. Retinal vessels accompanied the membrane, and were partly buried in it, but there were no vessels to be seen in the upper nasal quadrant of the fundus.

ALLING.

MIDDLETON (41, **Congenital eye conditions**) found, in his examinations, twenty-eight defects with few duplicates. From his descriptions, however, it is quite possible to infer that some of the cases might have been acquired—for instance, those designated as guttate choroiditis. Among the more interesting cases are congenital varicose retinal vessels, coloboma of the lens, and binocular sectional absence of iris pigment. Color plates and sketches illustrate the paper. ALLING.

V.—REFRACTION, ACCOMMODATION, AND THE SENSE OF SIGHT.

44. CANTONNET, A. **The examination of the visual apparatus of aviation candidates.** *Archives d'ophtalmologie*, xxxvi., 7.

45. DAVIS, A. E. **Accommodation in the lensless eye.** *American Journal of Ophthalmology*, December, 1919.

46. JESS. **Tonic accommodation.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., p. 114.

47. JESS. **Permanent injury of the entire retina by the rays of the sun.** *Ibid.*, February–March, p. 203.

48. NEWCOMB, J. R. **Refraction methods employed in the department of ophthalmology of the attending surgeon's office, United States Army, Washington, D. C.** *American Journal of Ophthalmology*, May, 1919.

49. SLONAKER. **The physiology of accommodation in the eye of the bird.** *Ibid.*, November, 1920.

50. VEASEY, C. A. **Paralysis of accommodation due to focal infection.** *Ibid.*, December, 1919.

51. WIESE. **Military hemeralopia.** *Archiv. f. Augenheilkunde*, lxxxv., p. 168.

JESS (46, **Tonic accommodation**) reports another case of this nature. The patient was a man 21 years old whose left eye was normal. His right eye was in a condition of reflex pupillary immobility. Eight to ten seconds elapsed during accommodation before this eye had adjusted itself to the near point. Relaxation of the accommodation, when the eye had been fixed on the near point, always took exactly five seconds, no matter whether the eye had been fixed on the near point only a few seconds or a longer time.

DAVIS (45, **Accommodation in the lensless eye**) attributes this phenomenon to the ability of the patient to interpret the dispersion circles, from the fact that the retinal image, with the correction for distance, is considerably larger than normal. Another explanation is that a small opening in the capsule serves to cut off the peripheral rays and lessens the circles of diffusion. Further, tilting of the lens might help in interpreting the image. He has observed slight changes in the curvature of the cornea during the effort of accommodation, but regards this factor as of little importance.

ALLING.

NEWCOMB (48, **Refraction methods**) states that the objective methods of examination are used almost exclusively in this department and mentions the value and reliability of the skiascope. For the subjective test of astigmatism a checkerboard chart is employed. After a cycloplegic has been used a miotic is always instilled.

Alling.

Veasey (50, **Paralysis of accommodation due to focal infection**) reports three cases of this sort, one being due to infection at the root of the central incisor and two to chronic purulent disease of the tonsils. The accommodation was restored in all after the removal of the focus of infection.

Alling.

Slonaker (49, **Physiology of accommodation in the eye of the bird**) describes the lens of the bird's eye as composed of two parts—a central spherical lens and, separated from this by a cavity containing fluid, an annular pad. The lens does not change its shape, but is moved forward by the action of the ciliary muscle, which is composed of striated muscle fibers.

Alling.

Cantonnet (44, **The examination of the visual apparatus of aviation candidates**) relates his methods of examination of the visual apparatus of candidates for the aviation service. Besides the usual routine examination by inspection, focal and transillumination, ophthalmoscopy, etc., he measures the acuity of vision in good, poor, and very strong light, rapidity of visual perception and the ability of discrimination of colors.

The purpose of examining the candidate's acuity of vision under various intensities of light is obvious. Very frequently fliers have to perform their perilous work during dark nights or under a very bright, dazzling sunlight. The method of examination consists of having the candidate read the test chart placed near a source of light of 800–900 candle power. Of 100 candidates with normal vision or better, only 14 have $\frac{10}{10}$ vision in dazzling light; 14 have $\frac{9}{10}$; 27 have $\frac{8}{10}$; 14 have $\frac{7}{10}$; 16 have $\frac{6}{10}$; 13 have $\frac{5}{10}$, and 2 have less than $\frac{5}{10}$.

The ability to read the test type in reduced light is measured by having the candidate stay in the dark for ten minutes and then having him try to distinguish a Landold ring illuminated by a source of light which is dimmed by a No. 14 smoked glass. Of 100 with normal vision, 23 begin to see the test type after three seconds; 43 after five seconds; 20 after ten seconds; 6 after fifteen seconds; 3 after twenty seconds; 3 after twenty-five seconds, and 2 could not see the type unless it was better illuminated.

These examinations brought out the fact that not all individuals with a normal acuity of vision see as well in a dazzling or dimmed light, and that some make good night aviators while others are doing better in daylight. The testing for color perception revealed that only 8 per thousand are green blind, and 2 per thousand are red blind, while a complete color blindness is a very rare occurrence. Binocular vision tested with the Remy Diploscope, was found present in 96 per cent., imperfect in 3 per cent., and absent in 1 per cent. SCHOENBERG.

JESS (47, **Permanent injury of the entire retina by the rays of the sun**) reports a functional impairment of the entire retina caused by the observation of an eclipse of the sun in 1912. The usual small retinal lesion in the macula was present. Investigation of the visual field with colored objects demonstrated an impairment of the rest of the retina. With the right eye only red objects could be perceived within a circumscribed area, while with the left the limits for red and blue were approximately the same. Saturated yellow could not be perceived as a color by either eye, green appeared to be blue centrally. Jess thinks that the yellow-blue sense was affected more than the red-green perception, which would indicate an injury to the layer of neuroepithelium. There was also a considerable disturbance of the dark adaptation.

WIESE (51, **Military hemeralopia**) has studied 105 cases of hemeralopia in the army, of which 77 stated that their trouble first appeared in the field. He made an adaptometer out of a cigar box with an electric light, the strength of which was regulated by an Aubert's diaphragm. Colored disks could be interposed. Among the cases were fifty-two myopes, sixteen hypermetropes, and eight with mixed astigmatism. Opacities were present in the media in thirty-one; in four these were minute lenticular opacities discovered only after the pupil had been dilated). In thirty-one changes in the light perceiving apparatus could be demonstrated. He concludes that in all of his cases there were present either changes in the refractive media, changes in the fundus, faults of refraction, or such general diseases as lead poisoning and neurasthenia. He did not meet with a case of simulation.

VI.—THE MOTOR APPARATUS OF THE EYE.

52. Cemach. **Contribution to the knowledge of the cochlear reflexes.** *Beiträge z. Anat., Physiol., Pathol. u. Ther. d. Ohres, d. Nase, u. d. Halses,* xiv., p. 1.

53. Cords. **Disturbances of the eye muscles in encephalitis lethargica.** *Klin. Monatsbl. f. Augenheilk.*, February–March, p. 210.

54. Fleischmann. **The relations between the vestibularis and the posterior fossa of the skull.** *Med. Klinik,* No. 11, p. 288.

55. De Kleijn and Magnus. **Tonic labyrinthine reflex upon the eye muscles.** *Archiv. f. d. ges. Physiol.*, clxxviii., p. 179.

56. Morax, V. **The utilization of the superior rectus in the operation for ptosis.** *Annales d'oculistique*, clxv., 2.

57. Onfray, R. **The physiological basis for methods of examination and treatment of convergent strabismus.** *La clinique ophtalmologique*, viii., 1.

58. Rauch. **Atypical and paradoxical vestibular reflexes.** *Monatsshr. f. Ohrenheilk. u. Laryngo-Rhinologie,* liii., p. 629.

Morax (56, **The utilization of the superior rectus in ptosis operation**) has seen within a short interval two patients each with an enucleated eye and complete ptosis. The latter condition was due to a traumatic paralysis of the levator muscle. The superior rectus was approached and dissected through an incision in the superior fornix, and attached by a catgut suture to the tarsus. The result was satisfactory in both cases.

Schoenberg.

Onfray (57, **The physiological basis for methods of examination and treatment of convergent strabismus**) says that systematic examination of a patient with convergent strabismus has to determine three factors: (1) The visual acuity of each eye and the possibility of improving that of the poorer of the two; (2) the presence or absence of cerebral coördination, as evidenced by our efforts to produce diplopia or binocular singular vision with prisms, amblyoscope, stereoscope, etc.; (3) the condition of the neuro-motor apparatus of both eyes. Our therapeutic efforts have to be guided by what we find along this line of investigation, and the success depends on how well we can correct the defect.

Schoenberg.

Cemach (52, **Cochlear reflexes**) discusses the auropalpebral and the otogenous pupillary reflexes. The former is a lid movement, varying from a slight trembling to a violent palpitation, excited by acoustic stimulation. It can be demonstrated in about 95 per cent. of all normal persons. It can be suppressed voluntarily and is rapidly weakened by custom. It is most marked in children and nervous persons, in the latter of whom other branches of the facial nerve may be involved. The reflex is induced most distinctly by short, loud sounds, evidently because inhibition is less active. High tones excite it most easily. Tactile stimuli by way of the trigeminus must naturally be excluded. The reflex is absent in total deafness. The otogenous pupillary reflex consists of a quick contraction of the pupil with subsequent slower dilatation. It was observed in about 27 per cent. of the cases, is not amenable to the will, and is most distinct in children and nervous persons. Pure tones, like those produced by the tuning fork, are best fitted for its excitation, tones with associated noises (overtones?) are less effective, and if the latter are very great, are ineffective. This reflex seems to be excited through the acoustic nerve because chemical and mechanical stimulation of the mucous membrane produces no effect on the pupil, and it fails to appear in total deafness.

De Kleijn and Magnus (55, **Tonic labyrinthine reflex upon the eye muscles**) constructed an enlarged model of the rabbit's eye, and determined by measurements in what position of the head the individual eye muscles attained their maximal and minimal shortening. Their conclusions are: In rabbits each position of the head induces a certain contraction of the muscles which is maintained as long as the head remains in that position. The externus and internus do not take part in this tonic reflex to any noteworthy degree. The muscles affected are the superior and inferior recti and the obliqui. Extirpation of one labyrinth showed that acts upon the obliques of both eyes in one way, and upon the two recti in the opposite. After bilateral extirpation of the labyrinths all tonic reflexes disappeared from the eyes.

Rauch's (58, **Atypical and paradoxical vestibular reflexes**) first patient was a child 5 years old with a left tuberculous otitis. Every time the child was laid down there was a well-marked vertical, sometimes rotatory, nystagmus which lasted for two minutes. He thinks that possibly the cause may have been a tubercle in the cerebellum. His second patient was 40 years old and had a chronic purulent otitis of the left ear with deafness. Spontaneous nystagmus was commonly absent, but at times appeared slightly to the right. Whirling to the left induced a vertical nystagmus in all positions of the head. He is inclined to ascribe this symptom to a trauma which the patient had suffered rather than to an injury of the labyrinth by the otitis.

So far as the movements of the eyes are dealt with in FLEISCHMANN'S (54, **Relations between the vestibularis and the posterior fossa of the skull**) paper, his views are given in the following conclusions: Vertical nystagmus is under all circumstances of central origin, because it is never met with in purely labyrinthine affections, and cannot be produced experimentally. Other forms of nystagmus may be of either central or peripheral origin. Vestibular disturbances are accustomed to compensate themselves fairly quickly, so a high degree of spontaneous nystagmus of peripheral, *i.e.*, otogenous, origin is always to be considered the result of a fresh condition of irritation. A spontaneous nystagmus which had maintained the same intensity for a long time, and is not accompanied by a subjective sensation of dizziness, may be at once ascribed to a central origin.

CORDS (53, **Disturbances of the eye muscles in encephalitis lethargica**) reports the eye conditions observed in three cases. In the first there was immobility of the right pupil, mydriasis of the left, paresis of the left internal and inferior recti, and a marked vertical counter nystagmus downwards; in the second there was bilateral ptosis, paresis of the inferior recti, and paresis of the accommodation of the left eye; in the third there was bilateral paresis of the abducens.

(*To be continued.*)

BOOK REVIEWS.

I.—**Plastic Surgery of the Face.** By H. D. GILLIES, Major R.A.M.C. H. Frowde, Oxford University Press, London, 1920.

In Gillies' Plastic Surgery the following features are of especial interest to ophthalmic surgeons. The author prefers a Thiersch graft for mucous membrane and an Esser epithelial inlay for lining a deepened sulcus. To obtain cartilage for transplantation an incision is made over the seventh costal cartilage; any cartilage which is left over is stored in an abdominal wound for future use. Combined fat and muscle flaps are used to fill small hollows.

Eyebrows can be replaced by a whole thickness free graft from the hairy scalp over the mastoid or by a pedicle flap carrying hair from the scalp region. The hair must grow in the right direction.

For the external angular process the use of cartilage is indicated, for the molar process a temporal muscle flap is satisfactory with and without a cartilage graft.

In a wound of the eyebrow region a flap of muscle was swung around and stitched in position to make contour. Subsequent depression was relieved by inserting cartilage through a small incision.

In building a lid the three elements, skin lining, cartilage support and skin covering must be considered. The operation is to be done in two stages: (1) Cartilage from ear or ribs of a suitable size is inserted beneath a flap extending outward from external canthus. When it has received its new blood supply the combined skin-cartilage flap is raised and swung over on a hinge near the canthus. The lower border of the skin flap is then sutured to remains of conjunctiva. The defect is covered by a Thiersch graft.

Lymph œdema of the lid can be corrected by excision of scar and swinging in of a cheek flap. In defects of the upper lid when it involves more conjunctiva than skin, the skin tucks itself in. Auricular cartilage can then be implanted into the skin and subsequently a combined skin cartilage flap is swung down.

In cicatricial sockets Esser's epithelial inlay is used. The grafted sulcus must be kept fully stretched for a considerable time after operation. After three months contraction ceases. A vulcanite model should be worn during this time. A double pedicle flap can be taken from the upper lid (Tripier).

In reconstructing lids support can be given by turning up local fat flaps from the neighboring region and are sutured to the periosteum.

Sunken sockets can be relieved by implanting cartilage or fat.

A. K.

II.—**Verhandlungen der Ophthalmologischen Gesellschaft in Wien. (Transactions of the Vienna Ophthalmological Society),** 1919–20, pp. 185. Berlin, 1920. S. Karger Karlstr 15.

The meetings of this society after an interruption of nearly six years were again resumed in January, 1919. The transactions are of unusual interest, containing many important clinical observations, papers, and discussions which are a testimony to the splendid spirit which our fellow workers in that unfortunate city are displaying. The collection of these transactions in a single volume is timely, though the addition of an index is desirable.

A. K.

III.—**Seventh Annual Report on the Ophthalmic Hospitals in Egypt.** By A. F. MacCallan, Cairo, 1920. Pp. 46.

In the various eye hospitals under government control 76,525 new patients were treated. The two important conditions are trachoma and an acute contagious conjunctivitis, which is the main cause for blindness. This conjunctivitis is caused by the gonococcus, the Koch-Weeks bacillus and the diplobacillus of Morax-Axenfeld; the pneumococcus is comparatively rare. The increase in acute conjunctivitis takes place coincident with the rise in temperature, which is illustrated by a number of charts. More than 1200 patients were blind in one or both eyes. Glaucoma was observed in 1715; optic atrophy in 136; cataract in 1498. Trachoma is present in nearly all of the school children and is treated in the schools. Statistics, list of operations and expenditures conclude the volume.

The director is to be congratulated on this splendid work which is being done under most difficult conditions.

A. K.

IV.—**Clinical Ophthalmology.** By Dr. A. MAITLAND RAMSEY, Glasgow. Oxford Medical Publications, London, 1920. Pp. 500.

This book was written at the request of Sir James MacKenzie, whose foreword is well worth reading.

While written for the general practitioner, it should appeal as well to the young ophthalmologist, especially in America, for in this country at least the ophthalmologist usually rushes into his specialty before he has a good foundation in general medicine, while the general practitioner as a rule knows nothing about the eye.

It is becoming more and more evident that the competent ophthalmologist must understand the pathology of bacterial infections and diseases of general matabolism; and, if we hope to reduce the appalling loss of sight from preventable causes, the general practitioner must learn the early diagnosis and treatment of such diseases as glaucoma, iritis, corneal ulcer, and the more common infections of the eye.

Dr. Ramsey's book is designed to meet this need, and throughout emphasizes the relations which exist between eye diseases and general or constitutional diseases. The chapters on the methodical examination of the eye, on iritis and on glaucoma are especially good.

A very complete formulary, with valuable therapeutic notes, is appended, which greatly enhances the value of the book.

The only serious criticism that can be offered is that focal infections have not been accorded their proper place in the ætiology of diseases of the eye.

The book is well written and deserves a wide circulation. There are 500 pages and the type is unusually good.

A. H. T.

V.—**American Red Cross Work among the French People.** By Fisher Ames, Jr. MacMillan Co., New York, 1921.

This is one of a series of books designed to educate the general public as to the nature and extent of Red Cross work during the Great War. It describes the many distressing conditions which arose in France during this time, and vividly relates how they were met.

Of especial interest to physicians are the chapters entitled "The Mutilés," "Propaganda," "The White Plague."

A. H. T.

VI.—**The Basis of Psychiatry** (Psychobiological Medicine). A Guide to the Study of Mental Disorders for Students and Practitioners. By Dr. Albert C. Buckley, Philadelphia, 1920. Pp. 447. J. B. Lippincott Co., Philadelphia and London.

The introductory chapter gives a historical résumé of the development of psychiatry as a branch of general medicine, especially during the past 25 years. Dr. Buckley points out that the biologic is the most rational approach to the study of psychiatry because all mental phenomena, both in health and disease, are the biological reactions of the individual as a whole, rather than that of any particular organ or group of organs. The predisposition to disease, it is explained, often means the absence—often hereditary—of some necessary factor which renders the individual unable to function in a normal manner, thus making it easier for an exciting factor to interfere with normal functions or give rise to abnormal functions.

The second chapter deals with biologic phenomena, and describes the evolution of nervous and mental reactions from the simplest to the more complex forms. The influence of heredity upon mental development receives especial attention, and Galton's and Mendel's laws are explained in considerable detail.

In this and succeeding chapters especial reference is made to night blindness, color-blindness, retinitis pigmentosa and other eye diseases, the transmission of which is regulated by the laws of heredity.

Because of its frequent reference to eye diseases, and because most, if not all of the psychoses are due to a failure of the individual, through some organic defect or toxic influence, accurately to adapt himself to his environment, and since this adaptation to environment is brought about by a proper functioning of the senses, chief of which is the eye—the book should be of especial interest to ophthalmologists.

A well written chapter is devoted to a description of psychological processes. The simple sensations are first described, then the various perceptions arising therefrom. In this chapter also are described the various emotional states and the influence of the emotions on adrenal and other glandular activity.

In the classification of mental diseases Dr. Buckley uses the classification adopted by the American Medico-Psychological Association in 1917.

In his discussion of the ætiology and treatment of the psychoses Dr. Buckley strives always to discover and remove the underlying organic defect or toxæmia; or, this being impossible, to create an environment to which the patient can better adapt himself.

The arrangement of the book is logical, the subjects are well balanced and the subject matter thoroughly scientific and up-to-date. We know of no better book for the beginner in the study of psychiatry. As a good introduction to this excellent book we would suggest *Comparative Physiology of the Brain and Comparative Psychology*, by Dr. Jaques Loeb (Putnam, 1900).

A. H. T.

VII.—**Tropical Ophthalmology.** By R. H. ELLIOT, London, Lieut.-Col. I. M. S. (retired). 524 pages with 7 plates and 117 illustrations. London. Henry Frowde, Oxford University Press, 1920.

In the tropics, according to Colonel Elliot, there are first of all a large number of eye cases and many are seen at a later stage than is usual, as they have been neglected; the refraction cases are few in number and there is but little demand for squint operations. It is interesting to note that in the author's opinion diet is not a factor in tropical eye conditions. After an introduction on certain general conditions which influence eye diseases in the tropics, the subject is taken up under the following headings: The Effect of Exposure to Strong Light, to Dust and to Wind. Injuries by Animals. Parasitic Disease. The Indian Operation of Couching. Cataract Extraction. Diseases of the Conjunctiva, Cornea, Lids, and Lacrimal Passages. Glaucoma. New Growths. Refraction. Ophthalmoscopic Appearances in the Tropics. Hospital Management and General Diseases.

"Glare Asthenopia," as designated by the author, is a real condition and one not sufficiently noted by the profession, occurring gradually and insidiously to some after long exposure to tropical glare. It is probably due to the action on the conjunctiva of rays from the violet end of the spectrum. Glare conjunctivitis is closely associated to the preceding, except that it comes on more acutely and the physical signs are more definite. Night blindness and xerosis of the conjunctiva are due to a nutritional disorder and to the action of light, as they occur only in the brighter months of the year. The injuries and diseases of the eye which are due to tropical animals and parasites are not infrequent.

The couching for cataract is so prevalent in the tropics that the subject is dealt with at some length. Cataract is treated fully, especially from a practical standpoint. As for the method, objections to the intracapsular operation are: (1) a more difficult technique; (2) necessity of a trained assistant; (3) greater percentage of vitreous loss; the large number of upward dislocation of the pupil point to a serious disturbance of the vitreous body; (4) the vitreous may adhere to the wound and distinct after cataracts do occur as a result of changes in the anterior layer of the vitreous. The method advocated is the one practiced in Madras and is from the pen of Lieut.-Colonel Kirkpatrick. The first step consists in laceration of capsule with a Bowman's needle; the other steps do not differ from those generally practiced.

Glaucoma occupies but a few pages, the question of its frequency, the various types met with, especially glaucoma secondary to cataract, and the necessity of prophylactic operation, are discussed.

Optico-ciliary neurectomy is the substitute for enucleation in painful absolute glaucoma, as the natives are adverse to removal of an eye.

Of the fundus changes two conditions are unusually prevalent in the tropics, optic atrophy in 32 per cent., retinitis pigmentosa in 12 per cent. The section on general diseases treats among others of beriberi, dysentery, leprosy, malaria, quinine poisoning, pellagra, and trypanosomiasis.

Colonel Elliot has placed ophthalmologists, particularly those working in the tropics, under great obligations. These observations of many years' experience, together with complete literary references, contain much of not only interest but of great importance, written in a readable and attractive style. The illustrations are well-chosen and the bookmaking up to the high standard of other Oxford University Press publications.

A. K.

VOL. L. NO. 4.

ARCHIVES OF OPHTHALMOLOGY.

PHACŒRISIS.

By DR. I. BARRAQUER, Barcelona, Spain.

(*With thirteen illustrations on Text-Plates XVI.–XX.*)

I. DANGERS OF CAPSULOTOMY AND ADVANTAGES OF COMPLETE EXTRACTION.

SINCE Daviel all ophthalmologists, knowing the complications of the cataract operation, have favored total extraction, but it has not become generally adopted because there was lacking an easy method which did not expose the eye to serious danger.

1. In studying the ætiology, development, and cure of the complications which occur at operation and in the after-treatment following extraction with capsulotomy, we see that:

(*a*) The repeated pressure which is exerted on the eyeball with instruments or through the eyelid with the finger to extract the retained cortex, injures the eye and favors the loss of vitreous. Prolonged toilet, irrigation of the anterior chamber, and other maneuvers which aim to remove the cataractous remnants predispose to iritis without completely succeeding in their object.

(*b*) Degenerated crystalline products which remain in the eye in varying degree obscure the pupil and dim the vision. These remnants, dissolved or emulsified in the aqueous humor, exert an inflammatory reaction and an endothelial proliferation which cause the secondary cataract to thicken, to form adhesions to the iris and other inflammatory lesions. The aqueous humor is thus transformed into a good medium for the culture of microbes. Degenerated fragments of the lens, like the globules of Morgagni, vesicular cells, cholesterine, calcareous remnants, and sclerosed lenticular fibers, may remain between the lips of the corneal wound, retard its healing, and facilitate intraocular infection. Tags of the capsule may also become incarcerated in the wound, inviting the entrance into the interior of the eye of the germs which cause plastic iridocyclitis and other infections.

(*c*) A second operation to clear the pupillary opening of capsule (discission) or to remove the membrane which has followed iritis, and iridocyclitis due to the inflammatory reactions above described (irido-capsulotomy) expose the eye to serious complications without always restoring vision.

2. In total extraction:

(*a*) When we remove the lens completely in its capsule in a single step, we avoid introducing many instruments and many maneuvers into the interior of the eye, and if we do not press upon the eye we avoid the causes of complications.

(*b*) By not leaving even the smallest remnant of cataract nor of its capsule, as after the extraction of cataract in its capsule, we avoid all the unfortunate consequences produced by the inflammatory action of lens debris and their being caught in the corneal wound.

(*c*) All operations and their dangers are avoided because we do not leave any remnant of cataract nor of capsule and we have no inflammatory iritis. Normal vision is assured because nothing interferes with the transparency of the pupil and wound healing has taken a normal course.

II. DESCRIPTION OF THE APPARATUS.

Figure 1 shows a longitudinal section of the cup and of the vacuum pump. The cup consists of a suction cup 1 and a tube 2, terminating in a connection 3 which fits into a conical seat 4 of a distributing body 5. This body consists of a conduit 6, dividing into two small branches 7 and 8, which communicate with a chamber 9, on which are placed two conical valves 11 and 15, opposite to one another. Valve 15 closes the opening of channel 7, when seated, or gives access to air when open.

When valve 11 is closed passages 8 and 10 do not communicate. When slightly open it permits a communication across the chamber 9. Valve 11 is fitted with a pin 12, which is screwed into valve 15 and the valve 11 is acted upon by a compression spring 13 held in place by a cap 14. Passage 10 communicates with conical chamber 17, in which fits plug 18, which is center bored 19, and ends in a nipple 20, for attaching the tubing which transmits the vacuum from the pump described below. When the suction pump acts intermittently the vacuum is not produced in the cup because the operator holds the valve 15 slightly off its seat, and passages 7 and 2 communicate with the air, valve 11 is pressed down on its seat, prevents any communication between channels 8 and 10 and between channel 3 and the intermittent vacuum pump. If the operator wishes to create a vacuum in the cup, he closes valve 15. This automatically opens valve 11; this is due to action of the pin 12 connecting the two valves. Then the cup adheres from the action of atmospheric pressure and by the small oscillations due to its vibratory movement, produced by the intermittent vacuum pump. Whenever the operator wishes to suspend the action of this vacuum, it is only necessary for him to open valve 15, which at the same time closes valve 11. According to the physical conditions of various cataracts, it is desirable to be able to regulate the intensity of the vacuum produced in an intermittent manner, being careful that this vacuum is not absolute and it is sufficient to obtain a relative rarefaction of air in the interior of the cup. This is possible through the disposition of grooves situated in plug 18 and in its conical seat 17. In some of the models this regulating action has been placed in nipple 36. The pump is in two parts; in the upper 23 is an electric motor, of which the armature is shown in 24 and the field planes in 25 and 26, the collector in 27. A flexible shafting 28 leads to a cylinder 29, in which is fitted a solid movable piston 31, turned to fit the cylinder exactly. At the bottom of this cylinder there is a groove 32, in which is placed the shaft 33 attached to bottom of chamber 34 for the purpose of adjusting the position of cylinder 29. The shaft 33 is eccentric in its relations to the axis of 29. When cylinder 29 takes a rotary movement, piston 31 makes a to and fro movement in its seat 30 on account of its connection between the shaft 33 and the groove 32. A tube 35 leads from the chamber 34 to the opening 36, where there is a nipple to receive the rubber tube by which the suction is transmitted to the cup. The opening of tube 36 in chamber 34 is situated at the level of the opening 30, which contains piston 31. At the same level there is another channel 37, which opens into chamber 34 and into an upper chamber 38. At the point where channel 37 opens into chamber 34 circular grooving 39 has been cut in the cylindrical wall of chamber 34. Whenever piston 31 is drawn away from the opening of the interior mouth of tube 35, piston 31 is separated from the end of 29 and consequently it leaves a part of seat in bore 30 unoccupied and this motion of the piston sucks air from 35. This vacuum is transmitted through 35 and the connecting tube to the cup in which the air rarefies if communication 7 is shut off from the air. The air which by suction has penetrated into space 30 is expelled across groove 39 and tube 37 to chamber 38. This chamber up to a certain height and the entire inferior part of the apparatus contains lubricating oil to hermetically seal the lower chamber, the level reaching up to 40. The air which escapes from 37 to 38 passes through masses of oil and leaves externally by an opening 41 adapted for this purpose. The pump is driven by an electric motor, 24, 25, 26, and 27. The current is introduced at 42 and 43, producing in 39 by piston 31 a succession of repeated strokes in tube 35 and consequently in the cup, these periods being more frequent as the angular velocity in 29 is greater, this being governed by the heaviness of the oil. If this oil is thick it offers greater resistance to the motor and its speed is consequently lessened. It is indispensable to have a firm closure of the valves and the mechanical action must be very carefully looked after.

III. PREPARATION FOR THE OPERATION AND ITS TECHNIQUE.

This method of removal of the total lens is simple and is compatible with any method of performing the other steps of the operation. But in this article I am planning not only to show you how the apparatus works, but also to explain the many small details by which I have obtained so good results, most of which have been learned from the experience of my father.

1. Operating Room.—In the operating room the light must be diffuse and feeble. The operative field is to be illuminated obliquely by a projector, so that it is possible to see distinctly through the cornea into the anterior chamber, to recognize the smallest details in order to determine the methods of extraction which should be performed in the individual case. The operator alone is to speak to the patient; the assistants must remain silent. The instruments, carefully selected and sterilized, are placed always in the same order on a special stand near the field of operation, so that the operator, who is sitting on a stool at the head of the patient, may take up the instrument desired without removing his gaze from the eye of the patient. The surgeon and his assistants must follow the most rigorous antiseptic precautions and they should wear blouses, masks, and gloves of sterilized thread (Figure 2).

2. Preparation of the Patient.—Two hours before operation and after having washed the eyelids and the neighboring regions with soap, the ciliary border of the eyelids is painted with a 4% solution of nitrate of silver, neutralized by sodium chloride (Figure 3). The external disinfection is concluded by rubbing the eye with biniodide of mercury oil. The conjunctival sac is irrigated with an irrigating apparatus containing sterilized serum (Figure 4). Then for every ten minutes the operated eye receives the following drops which are prepared on the same day and are sterilized: cocaine hydrochlorate 0.25, euphthalmine hydrochlorate 0.25, adrenalin 3, sodium chloride (0.6%) 3. By this means anæsthesia and dilatation of the pupil are obtained after an hour and a half.

When the patient is placed on the operating table and surrounded with sterile towels which leave the two eyes exposed, we again irrigate the conjunctival sac, everting the upper eyelid with a rubber forceps so that the entire surface of the conjunctiva is irrigated. Some more drops of the above mixture are instilled and we teach the patient to move his eyes quietly down and up and to close the eyelids. Whenever there is a spasm of the fibers of the orbicularis or sudden twitching of the eyelids, it is desirable to produce a temporary paralysis of the orbicularis according to the method of van Lindt and Villard, with an injection of novocaine into the branches of the facial nerve.

3. Fixation.—The assistant sitting to the right of the surgeon raises the upper eyelid by a Desmarres elevator, holding it in his right hand and at the same time drawing upwards the eyebrow with his little finger. The lower lid is held down with the other hand. The surgeon takes hold of the conjunctiva and the subconjunctival tissues 1*mm* below the vertical meridian of the cornea with Landolt's forceps, without making any pressure upon the eyeball (Figure 5). The speculum so frequently employed does not bring the eyelids forward and the fixation at the nasal extremity of the horizontal diameter of the cornea facilitates pressure on the eye at the moment of puncture.

4. Section.—The flap must measure two fifths of the corneal circumference, with a small scleroconjunctival flap. The Graefe knife is held like a penholder with the right hand for the right eye and with the left hand for the left eye. The puncture is made in the direction of the radius of the cornea, 1*mm* above the horizontal meridian. As soon as the thickness of the cornea is traversed, the blade of the knife proceeds parallel to the plane of the iris and in this meridian until it strikes the symmetrical point opposed to the point of puncture in order to make the counter puncture, after which in depressing the handle the inner third of the section is made. The third of the flap on the side of the puncture is cut in withdrawing the instrument, while the middle scleroconjunctival third is severed in directing the blade of the knife backward. During the corneal section the eye must not be displaced nor be permitted the slightest deformation. This is easily obtained if we use a perfect knife, making the puncture in a radiating direction, cutting slowly and uniformly, very gently, and being particularly careful not to exert any pressure with the forceps. A section which is too scleral cuts with difficulty in echelons and is predisposed to accidents during and after the operation. Indocile patients, insane, or those disposed to vomiting or to cough, and particularly in all of those in whom a loss of vitreous is feared or a turning back of the section, we make use of the conjunctival suture (Figure 6). Corneal suture before the completion of the section requires the exertion of slight pressure, which should always be avoided as it may cause a rupture of the zonule.

5. Iridectomy.—A small iridectomy may be made if the cataract is swollen and large. It, however, predisposes to the zonular fibers being caught in the corneal wound. In order to avoid this, I prefer to make only a small peripheric opening in the iris, which always prevents iris prolapse (Figure 7).

6. Extraction.—During this period the eye must be free without fixation. The assistant holds the lid gently drawn from the eye, supporting the hand on the cheek bone. The upper lid is drawn forward with the elevator of Desmarre, held in the operator's left hand (Figure 8). The patient looks slightly downwards. The erisiphaque is held with the right hand, as is shown in Figure 9. Without pressing on the valve 15 the cup is introduced into the anterior chamber on the side of the puncture for the right eye and near the counter puncture in the left eye, proceeding to the center of the pupil and still beyond, behind the iris, slipping along the anterior surface of the lens without producing the slightest pressure on the lens, at the same time perfectly adjusted to its surface. Then, without causing the slightest movement to the instrument, the hand being supported on the forehead of the patient, button 15 is pressed, whereby the vacuum enters into the cup and the lens is gripped. We recognize the completion of the vacuum by slight and repeated oscillations which cause a vibration of the lens itself. The zonular fibers are thereby put on the stretch, according as the dimensions of the lens are deformed in order to fill out the cup (Figure 10). The vacuum intensity to be employed varies between 55 and 65*cm* of mercury. An excessive degree of vacuum will rupture the capsule, while an insufficient degree allows the apparatus to slip from the cataract.

When the lens has been taken hold of by the cup and the zonular fibers are ruptured, we deliver the cataract by its upper border, if an iridectomy has been made, while its inferior border follows the curvature of the patellar fossæ, remaining always in contact with it without any pressure on the vitreous. The posterior surface of the lens must rub the scleral lip of the wound (Figure 11). If the patient looks down too far, or if the palpebral fissure is opened too widely, there is danger of loss of vitreous.

In simple extraction or in peripheric buttonhole iridectomy, we allow the lens to deliver by its inferior border, which is easily done by turning the instrument so that the posterior surface of the lens presents towards the cornea. This is the method most to be recommended and in which one observes the fewest accidents (Figure 12).

During the steps of the extraction, which must be done slowly and gently, it is best for the patient not to look down too far and that the palpebral opening be not widely separated. The eyelids must be drawn forward and we must be careful that the lens does not during its movements cause any pressure on the vitreous.

7. Toilet.—In case that an iridectomy has been done, it is necessary to replace the columns of the coloboma and to replace into the chamber any fibers of the zonule which may have been caught in the wound. If extraction without iridectomy, all that is necessary is to place in the conjunctival sac some eserin salve 0.5% and to take due care that the conjunctival flap is in place.

8. Bandage.—The patient having gently closed his eyes, we apply bichloride salve 1 to 3000 to the eyelids, which kills the germs which are apt to grow out of the skin with the growth of the eyelashes. Gauze and cotton dressing is applied to each eye, held in place by adhesive straps applied to the temple, forehead, and cheeks (Figure 13).

IV. AFTER-CARE OF THE PATIENT.

We do not change the binocular dressing for three or four days, after which the eye which is not operated upon is left open. The operated eye remains bandaged for one week. During this time we do not do any dressings, because if the operation has been done according to the proper rules the patient does not have any complications or reactions. One sees a black pupil, round, central, reacting promptly to light and iridodonesis. It is striking to observe at the first dressing that the patient will present the usual appearance of operated eyes after two or three weeks. The percentage of operated-on eyes with visual acuity of 1 is much greater than that obtained by capsulotomy, and this normal vision is obtained from the first day to the particular astonishment of the assistants and to the great joy of the patient. This is in striking contrast to the discouragement of not seeing sharply in the first weeks after an operation which so many patients on whom a capsulotomy operation is done have to suffer from.

V. CONCLUSIONS.

1. The accidents of the capsulotomy operation depend upon repeated pressure and maneuvers which we must make in order to remove as much as possible of the cataract; the persistence within the chambers of the eye of degenerated remnants of cortical material and of the capsule which is so readily caught within the wound, and the secondary operations undertaken to clear the pupillary region of the secondary cataract and to improve vision.

2. In phacoerisis we reduce the number of maneuvers within the eye to one; we use only one instrument and do not exert any pressure. In removing the entire capsular bag no remnant of cataract remains within the eye to produce inflammation and we obtain a perfectly transparent pupil. No other operations are necessary, because nothing interferes with vision.

3. The erisiphaque is a pneumatic forceps and a zonulotome, because the cup grasps the lens and causes a vibration whereby the fibers of the zonule are torn. This is an apparatus of precision, of delicate execution which must be perfect in its smallest details, adjustment, intensity, number of vibrations, etc.

4. The operation is simple and easy if the following rules are observed.

5. The operating room must not be too bright and the operative field must be illuminated obliquely with a photophore.

6. The pupil must be dilated at maximum. Anæsthesia and antisepsis must be perfect and the patient must be educated or the orbicularis should be temporarily paralyzed. The patient must never look strongly downwards.

7. The eyelids and the eyeball must be fixed without pressure. The eyelids must be drawn forward.

8. The flap should measure two fifths of the cornea; it must be cut gently without compressing or exerting any violence on the eyeball.

9. Iridectomy should be exceptional and peripheric button-

hole iridectomy is preferable, in which the iris is not drawn outside of the anterior chamber.

10. The lens is to be extracted slowly, with gentleness, without pressing on the crystalline lens when the cup is applied.

11. Toilet should be restricted to preventing anything being caught within the wound.

12. The bandage should be simply fastened to the skin of the surrounding region.

13. Put off the first dressing as long as possible. Normal visual acuity is obtained in a few days and in a percentage greater than that obtained after capsulotomy.

GLAUCOMA AND THE NASAL (SPHENOPALATINE (BNA.) MECKEL'S) GANGLION.[1]

By Dr. M. H. POST, Jr., St. Louis, Missouri.

THE ætiology of glaucoma is a subject that has occupied the minds of ophthalmologists from the beginnings of the science of ophthalmology. But the correct conclusion is still beyond our grasp. The final solution of this problem must ultimately be based upon the summation of many contributary observations, and realizing that fact, this paper has been written.

The summary of ideas to date has been very clearly stated by Dr. Wm. Campbell Posey in a recent paper read by him before the New York Academy of Medicine, January 19, 1920. (1) He there defines the two chief theories as being (1) the secretory theory, an increase in secretion as a consequence of some form of nervous irritation; or (2) the so-called retention theory, that it results from a mechanical obstruction, which is offered to the outflow of fluids from the eye.

Lagrange (2), who has been one of the chief exponents of the hypersecretion theory, believes it to be due to an excitation of the sympathetic nerve supply, and to an alteration in the blood vessels, and that secondary to this disturbance comes the obliteration of the excretory channels.

The nasal ganglion is the particular part of the sympathetic nervous system with which this paper is concerned. It is, however, advantageous to have a brief survey of the situation from a broader standpoint before taking up this more limited phase of the question. Casey Wood (3) has done this splendidly in his, "Excision of the Superior Cervical Ganglion."

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[1] Read in abstract before the St. Louis Ophthalmic Conference, December 10, 1920.

There he gives the conclusion from the evidence collected by the symposium on the relation of the cervical sympathetic to the eye, held by the Section of Ophthalmology of the American Medical Association in New Orleans in 1903, and quotes as follows: "Electrical stimulation of the cervical sympathetic produces at first an increase and later a decrease of intraocular tension, the increase being probably due to an effect on the muscles of the eye. Slow acting, mechanically produced, irritation of the sympathetic causes a rise of tension, which according to Lodato is independent of dilatation or constriction of the blood vessels and also independent of the state of the pupil. Section of the sympathetic ganglion is followed by a fall of intraocular tension, which depends on vascular and perhaps muscular changes. The lowering of tension is perhaps more decided after excision of the ganglion than after section of the sympathetic cord, but in either case the effect is a temporary one, and may last more than a few days and sometimes disappears within a few hours."

The three principal conclusions reached were: (1) that stimulation produced increased tension; (2) excision was followed by a fall in intraocular pressure; (3) that this fall was only a temporary one; the changes being due to vascular and muscular alterations.

At the above mentioned symposium, de Schweinitz states that as early as 1727 Pourfour de Petit observed that, after section of the sympathetic the eye was softer. This operation was first proposed by Abadie (4) in 1897, who believed that increased tension was due to a vascular disturbance, an active dilatation of the blood vessels, particularly the arteries, the result of which was an increased exudation. Jonnesco (5), who first published accounts of the operation, thought it was caused by constriction of the capillaries followed by increased intravascular pressure, and that from this resulted increased transudation and probably an increase in the amount of aqueous humor.

Several hundred of these operations were done and were particularly satisfactory in the chronic simple type. Wilder's (6) series of 68 cases show improved, 26; temporarily improved, 10; stationary, 7; unimproved, 26. Rhomer's (7) series of 114 cases show improved, 79; negative, 29; worse, 6. Wilder concludes that "there is by this operation in a certain proportion of cases of simple glaucoma, a definite and important result, and in some instances a decided improvement, even where a previous iridectomy has failed." Since that time, however, several patients have died as a result of the operation on which account it has been practically abandoned, although frequently of benefit.

In 1902 Rhomer (7) stated that excision of the ciliary ganglion produces a fall in tension and a pallor of the conjunctiva. He reported seven cases in which he claimed a partial reduction of tension following this operation. Its difficulty, however, made it practically prohibitive and it received little credence. No one attempted to follow him and Parsons believes that the results of Rhomer's work afford little support to the view that the increased intraocular tension of glaucoma is in any way associated with the ciliary ganglion.

Anatomically, we find that the sphenopalatine, also known as Meckel's, sphenomaxillary or nasal ganglion, is a small triangular reddish gray body with the apex backward, situated in the upper portion of the spheno maxillary fossa, although there is much variation as to the location. It is flat on its mesial surface, and convex on its lateral, and measures about 5*mm* in length. It receives the majority of its afferent fibers from the superior cervical sympathetic. It also receives fibers from the geniculate ganglion of the seventh through the great superficial petrosal. The second division of the fifth passes through it, but is apparently unrepresented among its neurones.

The efferent branches are usually divided into three groups, ascending, descending, and internal. The first of these are otherwise known as the orbital branches. Piersol (8) describes them as two or three tiny filaments passing into the orbit through the sphenomaxillary fissure and after traversing the posterior ethmoidal canal, or a small special aperture, are distributed to the sphenoidal and posterior ethmoidal air cells, and the periosteum of the orbit. Liedeman (9) describes an ascending branch to the lower angle of the ciliary ganglion. Hirzel and Arnold (9) traced filaments to the optic nerve or its sheath. Roth and Valentin (9) describes a branch ascending to the sixth nerve.

From these anatomical relations it would seem, that blocking of the nerve impulses at the nasal ganglion should produce results similar to extirpation of the superior cervical sympathetic, and by a far less dangerous and difficult technique, as evidenced by the fact that Dr. Greenfield Sluder has injected, with alcohol, about 2000 ganglia for various conditions with no bad results.[1] It might have the further advantage of being more permanent than operations on the cervical sympathetic as being more liable to block any collateral nerve supply, such as appears to become established in some cases shortly after the removal of the latter.

In 1887, Emil Berger, as noted by himself (10) stated, that a direct influence upon intraocular tension, visual fields, etc., was exerted by morphine and cocaine applied to irritated tissues in the nose, and that the tension in persons predisposed to glaucoma, was lowered thereby. He attributes this action to the trigeminous as being the result of vaso-constriction of the vessels of the iris. The latter findings do not seem to coincide with our observations, a point which we return to later.

Various methods of nerve blocking have been tried in collaboration with Dr. Sluder, who has very enthusiastically carried on the nasal work, and some very interesting facts have been established.

Dr. Sluder was first led to a belief that cocainization of this ganglion might give relief in glaucoma, from his experience in cases of obscure headaches. In 1908 Dr. A. E. Ewing sent him a patient who had had an iridectomy for glaucoma three days previously and was again having an attack of increased tension. Unfortunately eserine ½% was used and given to the patient at the first examination before nasal treatment was instituted. A 50% solution of cocaine was applied to the region of the nasal ganglion which membrane was much reddened and swollen. Within a few minutes the pain in the eye and temple had ceased entirely. The next morning the patient was much improved. This latter fact, I believe in view of our present information, was due to the use in the meantime of the eserine solution, as the effects of cocainization could hardly have lasted for such a period of time.

Dr. W. H. Luedde (11) reported three cases in October, 1912. The first of these consulted Dr. H. Edward Miller, with a tension O.D. 60*mm*, O.S. 51*mm*. No miotic was used. There was severe suppurative pansinusitis right and left. He used cocaine freely to shrink the swollen membrane. Three quarters of an hour later without further ocular treatment, tension O.D. 55*mm*, O.S. 37*mm*, a marked decrease on the left side. During the next three days under eserine, the tension fell to 26*mm*, at which time the patient left the city. The second case showed the middle meatus almost closed with swelling. Anæsthetization of the ganglion was followed by a rise of tension from 70*mm* to 73*mm*. On the following day, before nasal treatment the tension was 44*mm*, having been reduced by the use of eserine. After anæsthetization of the ganglion the tension remained the same. We believe the failure in this case can be attributed to the acute congestion of the nasal mucous membrane, preventing the absorption of the cocaine solution and its proper application directly contiguous to the ganglion. In the third case, no mention is made of the nasal condition. The tension before anæsthetization was, O.D. 17*mm*, O.S. 15*mm*. After treatment O.D. 18*mm*, O.S. 17*mm*. This case illustrates the fact, which has been observed several times, that the tension of the normal eye is not altered by anæsthetization of the ganglion. That the ganglion was reached by the anæsthetic was demonstrated by the finding that pain which could not be controlled by atropine locally, was immediately relieved.

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[1] Abducens paralysis in one case.

In June, 1913, Dr. H. Edward Miller (12) published an account of the nasal treatment of the first case reported by Dr. Luedde with additional notes of further work at subsequent date. He there states, that owing to the marked inflammation of the nasal tissues, it was impossible to anæsthetize the ganglion by applications of cocaine. This lead him to attempt injecting the ganglion with six minums of 5% alcoholic solution of phenol. Tension quickly rose, but the following day, dropped 20*mm*. Five successful attempts in all were made with an average rise of 10*mm* immediately after the injection, followed by an average drop of 17½*mm*.

These cases both from a practical and a theoretical standpoint left much to be desired. Practically, the constancy of the reaction, its amount, and its duration must be known, and made as great as possible. Theoretically, we must determine whether this is a specific reaction to cocaine or a definite nerve blocking similar to that affected by symphathectomy, and if possible how the effect produced causes a reduction of tension.

With these points in view, we have tried several drugs and combinations. Cocaine saturated solution alone, and cocaine and adrenalin 1-1000 half and half have been tried, and finally in an effort to prolong the period of lowered tension, alcoholic injections, 95% in phenol 5%, were used.

Eight cases have been used for the investigation to date, and nineteen observations have been made. A tabulation of these cases is herewith presented.

An analysis of the appended chart shows that, in four cases where the region of the nasal ganglion was cocainized, a fall of 9, 12, and 21*mm* was noted, within the next hour. The following day the tension had risen to slightly above the preliminary reading. The fellow eye was examined in only one case, and there the fall was 3*mm*. In cases number one and two, the middle meatus was cocainized with no measurable change in the tension.

In three cases, cocaine and adrenalin were used to anæsthetize the nasal ganglion. The two first of these cases were of the acute congestive type and no appreciable change occurred in the tension in either eye. The third case, of the chronic simple type, showed a fall of 9*mm* in the corresponding eye, but none on the opposite side.

We had hoped by combining adrenalin with cocaine solution to increase the extent of the reaction, but so far, possibly from a poor selection of cases have been disappointed in our expectations. The reason for this belief lies in the results obtained by Dr. W. E. Shahan and Dr. L. T. Post (13) in their study of the results obtained in lowering the tension by subconjunctival injections of cocaine and adrenalin. They found that epinephrine 1-4000 alone usually caused a rise in tension, cocaine 5% alone, produced some fall, but when combined with epinephrine 1-4000 it produced, in most cases, a more decided fall in tension, which lasted about an hour.

Analysis of four cases in which alcohol was injected into the nasal ganglion, shows in the first case a distinct rise in tension of about 7*mm* in the corresponding eye with no change in the fellow eye. In the second case, an initial rise of about 3*mm* followed by a fall of 20*mm*, which did not again regain the previous height for three weeks, after which time it again slowly fell, the fellow eye showed a fall of 5*mm*. The third case was scarcely conclusive as the patient was hard to control and used the miotic rather casually, previous to the time of the alcoholic injection. There was, however, a marked fall of 36*mm* without the initial rise being noted, probably, however, because the tension could not be taken at this time. The fourth case had had an iridectomy six months previously, but tension had again risen. For several days the patient had been using eserine $\frac{1}{120}$ every two hours, tension remaining at 51*mm*. With a view to reducing the tension preliminary to operation, the nasal ganglion was injected with alcohol at 12:30 P.M. At 3:15 P.M. the tension had risen to 55*mm*. Twenty-four hours after the injection it had fallen to 37*mm*, where it remained approximately until the operation, four days later. In case number five, an effort was made to inject the ganglion, but the unruliness of the patient resulted in a failure.

In conclusion, while I realize that the number of cases studied is insufficient to make any dogmatic statements, it seems to me definitely established that the intraocular tension can be affected by blocking the nerve impulses at the nasal ganglion, and that this is not a specific action of cocaine but a true blocking. The duration of the reduction of tension with cocaine and adrenalin is about one hour, and its amount is about 10*mm*. Whether this is increased by the addition of adrenalin, is still in doubt. Injections of alcohol produce a greater drop, about 15*mm*, which lasts for ten days, and perhaps longer, an observation in line with what would be expected from the anatomical findings; for it was noted by Otto May (14) that the gasserian ganglion examined two weeks after alcoholic injections, showed almost no cell destruction, the process having largely subsided at the end of that time.

In all of my observations it was found, that the applications of cocaine must be directly contiguous to the ganglion and the alcoholic injections must be directly into the ganglion, or no result is obtained. This fact coupled with the anatomist's observation, that the fibers of the trigeminus pass uninterrupted through the nasal ganglion, and the well-known experience of surgeons that extirpation of the cervical sympathetic reduces the tension in glaucoma, leads me to believe that the reaction is not due to the trigeminus, but rather to the sympathetic.

In none of these cases was a blanching of the conjunctiva or retinal vessels noted. It was also observed, that the size of the pupils remained constant, but this might readily have been due to the miotics, which were used in almost all these examinations.

Looked at from a practical therapeutic standpoint, the case of Dr. Luedde and Dr. Miller was certainly benefited, and it is my opinion, that in certain cases where pilocarpine and eserine are being used to the limit, they may be reinforced by cocaine or alcoholic injections in such a way as to carry the patient past the acute condition. I am of the opinion, that cocainization of the nasal ganglion immediately before, or better, injection of alcohol about four days previous to operation in order to still further lower the tension and perhaps help in producing anæsthesia, which is especially difficult in these cases, will prove to be of value, bearing in mind that it is used, not as a substitute, but as an adjunct to all other possible therapeutic measures.

In closing I want to express my appreciation of the painstaking work, and inspirational enthusiasm of Dr. Greenfield Sluder, who has made these observations possible, and also to Dr. Wm. H. Luedde for his many helpful suggestions.

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No.	Name.	Age.	Date of Treat.	O.D. or O.S.	Duration of Glaucoma.	Type.	Nasal Treatment.	Location of Application.	Tension Previous to Nasal Tr.	Tension Following Nasal Treatment.		Other Medication.
										1 Hr.	Subsequent	
1.	Mrs. F. E. D.	55	11/28/19	O.D	8 yrs.	Chronic Simple	Cocaine	Rt. Spheno Maxillary Foramen	40mm	28mm	24 hrs. 43mm	Pilocarpine 1/20 q3h Eserine 1/20 P.M.
	" " " "	"	"	"	"	Chronic Simple	Cocaine	Rt. Middle Meatus	39½mm	40mm		" "
	" " " "	"	"	O.S.	10 mo.	Chronic Simple	Cocaine	Rt. Middle Meatus	31½mm	29mm		" "
	" " " "	"	1/5/20	O.D.	8 yrs.	Chronic Simple	Alcohol Injection	Rt. Nasal Ganglion	33mm	37mm	24 hrs. 41mm 48 hrs. 44mm 10 days 39mm	" "
	" " " "	"	"	O.S.	10 mo.	Chronic Simple	Alcohol Injection	Rt. Nasal Ganglion	34mm	34mm	24 hrs 38mm 48 hrs. 41mm 10 days 27mm	" "
2.	Miss M. M.	61	12/5/19	O.D.	6.5 yrs.	Chronic Simple	Cocaine	Rt. Nasal Ganglion	52mm	43mm	24 hrs. 60 mm	Pilocarpine 1/20 T. i. d.
	" " "	"	12/5/19	O.S.	6.5 yrs.	Chronic Simple	Cocaine	Rt. Nasal Ganglion	25mm	22mm	24 hrs. 26 mm	" "
	" " "	"	12/11/19	O.D.	6.5 yrs.	Chronic Simple	Cocaine	Rt. Middle Meatus	55mm	52½mm		" "
	" " "	"	12/11/19	O.S.	6.5 yrs.	Chronic Simple	Cocaine	Rt. Middle Meatus	26mm	28mm		" "
	" " "	.	12/15/19	O.D.	6.5 yrs.	Chronic Simple	Alcohol Injection	Rt. Nasal Ganglion	52½mm	54mm	24 hrs. 37mm 48 hrs. 44mm 4 days 34½mm	" "
	" " "	"	12/15/19	O.S.	6.5 yrs.	Chronic Simple	Alcohol Injection	Rt. Nasal Ganglion	28mm	26mm	24 hrs. 26mm 48 hrs. 26mm 4 days 22mm	" "
3.	Mrs. A. E. McC.	76	2/11/20	O.D.	4 yrs.	Chronic Simple	Alcohol Injection	Rt. Nasal Ganglion	56mm		3 days 27mm	" "
4.	Miss M. S.	63	10/15/20	O.D.	2 yrs.	Acute Congest.	Cocaine and Adrenaline	Lt. Nasal Ganglion	53mm	59½mm		" "
	" " "	"	10/20/20	O.D.	2 yrs.	Acute Congest.	Alcohol Injection	Rt. Nasal Ganglion	55mm	51mm		" "
5.	Mrs. M. V. B.	57	12/30/19	O.S.	6 mo.	Acute Congest.	Cocaine	Lt. Nasal Ganglion	104mm	83mm		No other tr.
6.	Mr. R. J.	70	10/12/20	O.D.	Unknown	Acute Congest.	Cocaine and Adrenaline	Rt. Nasal Ganglion	69mm	72mm		" " "
7.	Mrs. R. D. K.	50	10/23/20	O.D.	Normal	None	Cocaine	Lt. Nasal Ganglion	19mm	19mm		Pilocarpine 1/20 T. i. d.
	" " " "	"	10/23/20	O.S.	7 yrs.	Chronic Simple	Cocaine and Adrenaline	Lt. Nasal Ganglion	47½mm	38½mm		" "
8.	Mrs. E. T. J.	70	12/7/20	O.S.	2 yrs.?	Acute Congest.	Alcohol Injection	Lt. Nasal Ganglion	51mm		3 hrs. 55mm 24 hrs. 37mm 48hrs. 38mm	Pilocarpine 1/20 T. i. d. Eserine 1/20 P.M. Iridectomy 4th day

A MERCURY TONOMETER.

By Dr. MARTIN COHEN, New York.

(*With six illustrations on Text-Plates XXI. and XXII.*)

PROFESSOR SCHIÖTZ was the first to measure intraocular pressure by means of a mercury manometer applied externally. This instrument was finally replaced by the present Schiötz tonometer, which is not only more readily applicable but possesses the principles of manometer and tonometer combined.

The Schiötz tonometer corresponds in its readings, as we have found, with the mercury manometer, but it is difficult at times to obtain a definite reading with precision on the former, owing to its sensitiveness, which causes its indicator to oscillate excessively. Julius Many, a mechanical engineer, to whom I gave a few suggestions, devised this mercury tonometer, and I have tested it both clinically and experimentally.

The mercury tonometer is based upon a simple physical law, and gives a direct reading in terms of *mm* of mercury of corneal resistance, which varies with intraocular pressure. Its readings are accurate and precise; it avoids the vibrations of an indicator by making use of a column of mercury in a glass tube, and no graphs or changing of weights are necessary. The instrument utilizes a single weight of mercury, on the principle of a mercury manometer. The mechanical adjustment of its various important parts, the plunger and the corneal foot plate, is controlled by the physical condition of the cornea and the intraocular pressure itself. It has been thoroughly tested on numerous human eyes with normal and increased pressure, and modified from time to time, until in its present form, its reading may be considered manometric in its accuracy.

The graduation of the scale was established according to the ratio of the area of the piston to the area of the bore of the capillary glass tube. Thus, the graduation is magnified ninety-four times, and a reading of 90*mm* of mercury on the tonometer signifies that the plunger has made an excursion of slightly less than 1*mm*. We accepted 20*mm* of mercury as the average normal intraocular pressure, according to Schiötz, and after indicating this normal finding at a fixed point on our scale, we examined over one hundred human eyes with normal pressure, and found that this average reading, as accepted, corresponded with the Schiötz tonometor. If any other point were selected as the normal, the accuracy of our readings would not be altered. Our calibration is equally divided, into division of 2*mm* of mercury and represents a straight graph from zero to a reading of 90*mm* of mercury, relatively corresponding to the mercury manometer. The calibration of the instrument is dependent upon several physical factors acting in unison, as will be explained.

The pressure of the mercury, combined with the weight of the piston and the plunger, produces dimpling of the cornea, which is dependent not only on the intraocular pressure but also upon the resistance of the cornea, as evidenced in tests conducted upon living or enucleated, normal or diseased eyes. If the corneal resistance is below normal, the intraocular pressure will be diminished, and vice versa. The same holds true with the intraocular pressure. As the corneal resistance is probably similar in all eyes, any slight differences must be considered as negligible in the estimation of intraocular pressure.

The adjustment of the instrument has been determined by testing it on human eyes, and experimentally with the aid of the mercury manometer on fresh and old enucleated human eyes, pigs' eyes, and rubber membranes. By these experiments we decided on the form, size, and weight of the instrument and its various parts, and established a straight graph.

Some of the important parts of the instrument will now be considered. The lower end of the plunger is made convex, since thereby it is easier to dimple the cornea and at the same time avoid injuring it. The extent of its convexity and length was determined after numerous tests on the living human cornea, giving an accurate reading from the highest to the lowest point on the scale, corresponding relatively with the reading of the manometer. The corneal foot plate was made flat at its periphery; and at a fixed point it takes the direction of a definite angle, as shown by the illustration.

When the instrument is applied to the eye, if the tension is low, normal, or about as high as 40*mm* of mercury, the foot plate will come in contact with the cornea only at its flat part, but at different points depending on the tension, as shown by Figure 2. But if the intraocular pressure is heightened, the foot plate will come in contact with the cornea at the interior of its angle, again at different points, depending upon the increased pressure. For example, if the tension is around 60*mm*, the contact will occur at the lowest extremity of the angle, as shown in Figure 3; if still higher pressure exists, the contact will occur near the highest extremity of the angle, as shown in Figure 4.

The fact that the thickness and curvature of the cornea vary slightly from its periphery to its center, was responsible for the unequal division of the scale in our earlier experiments. We were therefore obliged to establish a definite angle in the foot plate to overcome this condition, and also to permit the registration of the higher regions, thereby producing an equally divided scale and a straight graph.

The instrument is applied perpendicularly to the eye, after the instillation of holocaine, and is placed exactly on the center of the cornea, leaving a small rim of cornea exposed to assist in orientation. This position of the instrument permits the plunger to come into contact with the apex of the cornea, which is the most favorable point for measuring pressure. If the plunger is off center, we shall have a slightly higher reading, as the cornea is thicker at that point. The difference in tension is probably due to the difference in the corneal resistance of the areas examined.

After the application of the instrument to the eye, the plunger should be removed by slightly turning its exposed part; it, as well as the cylinder, should then be cleansed. This procedure will prevent the accumulation of foreign material, or the collection of tears.

From our experiments we have proved that capillary attraction need not be considered in making readings. Two applications of the instrument to the eye are sufficient, as frequent applications lower the intraocular pressure.

Figure 1 represents an elevation, showing the parts sectioned. The instrument consists of a metal tube; extending from its lower extremity is a foot plate. At the upper part of its interior is a reservoir of mercury, which is attached at its lower edge to a piston resting around the shoulder. The upper edge of the reservoir is hermetically connected to a capillary glass tube by means of prepared thread and a leather washer.

The glass tube carries a scale graduated in equal divisions, reading from zero to 90*mm* of mercury; at its upper extremity a lock is fitted in order that when in use it may be slightly raised to allow air to enter the tube; when not in use, it is pushed down to prevent any loss of mercury. A regulator is attached to the back of the scale, so that the zero point may be adjusted to a level with the mercury column. This regulator is rarely used, as extreme heat or cold will cause the height of the column to vary less than 2*mm*.

Surrounding the metal tube, is a handle which slides easily and avoids friction, and should simply steady the instrument in its proper position.

The weight of the instrument is 44 grams. It is so constructed that the pressure produced in the mercury reservoir by the rise of the mercury in the capillary glass tube, plus the weight of the plunger and piston, is accurately counterbalanced by the weight of the remaining portion of the instrument.

The reservoir is made of chemically treated fish skin, in order to maintain durability, softness, and consistency. Its thickness is only $\frac{1}{20}$*mm* throughout. The lower edge of the bag is attached to the piston; its upper edge, to a washer of the same diameter as the piston. The outer diameter of the bag fits exactly into the bore of the metal tube. We have used such a bag daily for over a year, without any change in its durability, softness, or consistency.

The glass tube is accurately gauged, and the bore is absolutely of the same diameter throughout. The graphs were made, as shown in the illustration, by using human enucleated eyes and applying the mercury manometer as indicated (Fig.

5), checking the readings from the zero point upward on the manometer, and comparing them with the tonometer at definite points.

We were able to secure a straight graph (Fig. 6) from zero to 80*mm* of mercury. From 80 on, however, it required great pressure to preserve the straight line, the variation being due to the flattening by the plunger of the corneal apex, which loses its resiliency in the dead eye. This flattening would not occur in the living eye.

Over 150 normal cases have been examined with the mercury tonometer, all giving the normal reading around the 20*mm* mark, agreeing with the Schiötz tonometer. In one case of simple glaucoma, the Schiötz tonometer gave a reading of 60*mm* of mercury. The mercury tonometer gave the same reading. The following day, after medication and massage, both instruments registered 50*mm* of mercury.

In conclusion, I desire to express my obligations to earlier workers in the same field. The instrument would have been impossible but for the invaluable researches of Schiötz, Priestley Smith, and McLean.

THE SURGICAL TREATMENT OF EPITHELIOMA OF THE CORNEA.[1]

By Dr. L. M. FRANCIS, Buffalo, N. Y.

(*With five illustrations in the text.*)

THE corneoscleral junction should offer a favorable site for the development of epithelioma for at this point there is a variation, in the kind of epithelium. As Fuchs has pointed out, this situation is the analogue of the predilection of epithelioma for similar transition areas in other parts of the body. This locality is also exposed to traumatism and various forms of irritation, which are supposedly contributing factors in the excitation of tumorous growths. Therefore, it is difficult to say why neoplasms are not encountered more frequently at the limbus. While the condition is not extremely rare, as a search of the literature reveals, yet no single observer has seen many cases. I may therefore be pardoned for presenting my experience with the few that I have encountered.

During seventeen years of rather active hospital and private practice, I have recognized four and probably five cases.

Case 1.—Has no direct bearing upon the phase of the subject I wish to present and may be mentioned here. J. H. D., No. 2552, male, age 50, a clerk by occupation, was seen November 15, 1910. Family history and general health, excellent. Wassermann and tuberculin tests negative. Fifteen years ago a spot appeared at the limbus in the upper nasal quadrant. The eye had not been painful at any time, but was frequently irritated. The patient complained chiefly of lacrimation and blurred vision. Examination showed an elevated mass occupying all of the cornea save a small clear quadrant downward and outward. The neoplasm had two large nodules on the cornea, the invaded limbus was infiltrated and adjacent bulbar conjunctiva much thickened and vascularized. This conjunctival envolvement gradually lessened as the fornix was approached. The fornix and palpebral conjunctiva appeared normal. (*See Drawing.*) An enucleation (not exenteration of the orbit) was done. The specimen was sent to Dr. E. V. L. Brown of Chicago who reported it as epithelioma of benign type with no involvement of the intraocular structures. Enough of a conjunctival sac remained to permit the wearing of a satisfactory prothesis. Despite the extensive involvement of the bulbar conjunctiva, I was surprised that there was no recurrence. This fact was of some value in approaching later cases.

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[1] Read before Section on Ophthalmology, New York Academy of Medicine, April 21st, 1921.

Case 5.—Likewise has no direct bearing on the subject as presented and will therefore be mentioned here. R. W. M., age 57, No. 1322, presented a small process at the limbus, recognized within the first six months and treated with radium with complete disappearance. The diagnosis was a clinical one and unfortunately the patient died from an intercurrent disease within the year after radiation. This case was presumably referred to by Dr. H. H. Janeway in a paper before this Academy, November 19, 1919, and published in Knapp's *Archives*, March, 1920. The remaining three cases will be presented later in this paper.

According to Panas, epithelioma of the limbus commonly starts from the outer side. This occurred in but one of my cases, the other four being located on the nasal side. One naturally looks for the process in the late segments of life. Four of my cases ranged from 50 to 76. Case number one, aged 50 when seen, dated his trouble back to 35, while another of my cases, Case 3, was 31 when seen, whose trouble appeared three years previously, namely at 28. (de Schweinitz and Shumway reported a case in a patient of 34 in 1913 before the American Ophthalmological Society.) It is interesting to note that in that article Rogman is quoted as reporting cases in patients age 20 months, 12 years, 13 years, 19 years, and 27 years. In the beginning stages the growth is essentially a superficial process with, according to Collins and Mayou, "a tendency to early growth forward in excess of its invasion of the tissues beneath, more so than in growths of a similar character in other localities, the firm fibrous cornea and sclerotic are not easily infiltrated by the growth which tends to spread in the line of least resistance" (Pyle's *System*, p. 107).

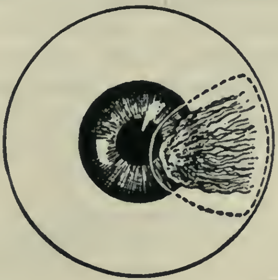

FIG. 1.

"The substantia propria offers some resistance to the invasion setting up a barrier of embryonic connective tissue around" the epithelial cells (*Am. Encyclopædia of Ophthalmology*, p.

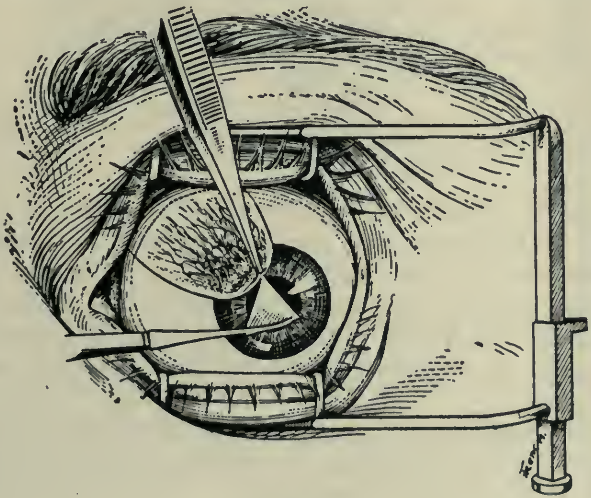

FIG. 2.

3363). According to Parsons (*Pathology*, vol. i., p. 145) "the corneal epithelium usually passes on to the growth unchanged, while the conjunctival epithelium passes into the tumor. The process gradually invades the substantia propria elevating Bowman's membrane. Posteriorly the episclera is gradually invaded but there is some resistance encountered in the lymph spaces between the scleral lamina." According to the article in the *Encyclopædia of Ophth.*, "the fact that the canal of Schlemm and the anterior perforating vessels lie under the conjunctiva accounts for the fact that the growth should rarely become intrabulbar." This is in variance with the opinion expressed by Ginsburg and Parsons, although held by Axenfeld, Wintersteiner, Saemisch and Greef. The same article advances the theory "that the intraocular pressure prevents the growth from breaking through elsewhere." (*Am. Ency. Oph.*, p. 3074.) LeGrange says that involvement of the lymph glands is rare but does occur. According to Parsons when convalescence does occur the preauricular are first affected.

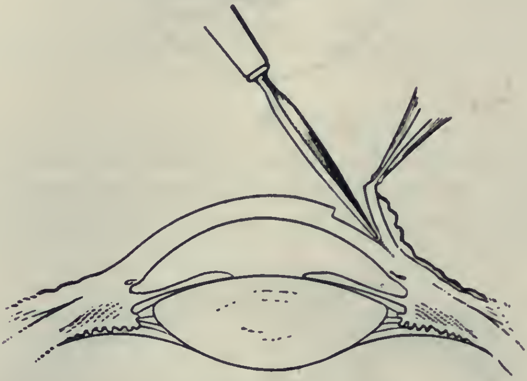

FIG. 3.

From the above and from a summary of the opinion of pathologists one may deduce what clinical experience usually substantiates:

1. That epithelioma at the limbus is a relatively superficial process, with slight tendency to invade the deeper structures because of anatomical barriers.

2. It is relatively non-malignant in type, of slow growth, showing long rest periods.

3. There is no tendency to involvement of neighboring lymph glands.

Therefore, a tumor of this general type and behavior invites surgical attack with a fair prospect of success, in spite of the statement made by Parsons and others "that there is a tendency to recurrence after removal."

Surgical interference in neoplasm of the limbus has the same object as surgical attack of malignant growth elsewhere in the body. The surgical problem is essentially the same: First: The removal of the diseased area in a well planned and thorough going way, until only sound and healthy tissue remains. Secondly: The preservation of the maximum of function and;

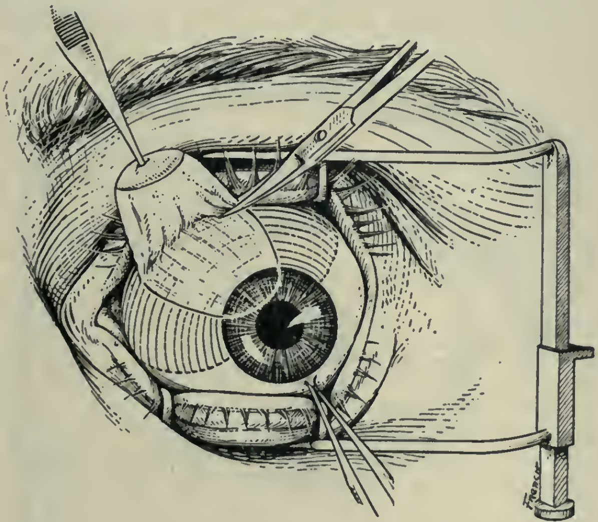

FIG. 4.

Third: The repair of the denuded area with sound tissue which will give proper support and strength.

The method of procedure employed in the cases to be reported has been the same.

With a strong keratome, an incision is made in the sound corneal tissue well in advance of the tumor border. This cut is made vertical to the plane of the cornea and extends down through the several layers nearly to Descemet's membrane and outlines the corneal extent of the growth as far as the limbus. By means of the keratome, the lips of the corneal wound is pried up until enough tissue has been elevated, to admit the firm grasp of a strong forceps. This corneal flap is peeled back by the aid of blunt dissection or the keratome until the limbus is reached. Here it is easier to continue the dissection by means of sharp pointed scissors. The flap is continued backward toward the fornix including the episcleral tissue. A sufficiently broad wedge of conjunctival tissue with its base to the fornix is removed to surely include all thickened and suspicious tissue. The denuded surface is then carefully inspected and any suspicious tissue is removed by means of sharp scissors and forceps. The conjunctiva on either side, above and below, is then freely undermined by blunt dissection and the denuded area is covered with a thick flap of healthy conjunctiva.

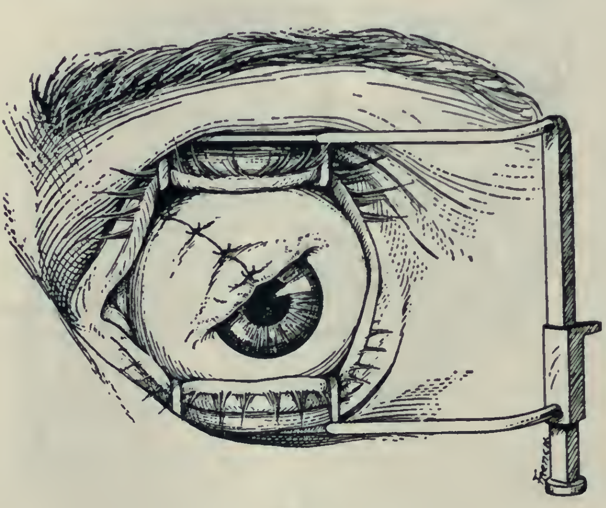

FIG. 5.

Because the purpose of this flap is one of support as well as repair it should include subconjunctival tissue. These flaps are held in apposition by twisted silk, preferably mattressed (note drawing shows single sutures). These sutures are permitted to remain until union has taken place, and may be removed on the fifth day.

CASE 2.—Fred C., age 76, of Ellicottville, N. Y., No. 8533, retired farmer. May 19, 1915.

History.—For about eight years has what he describes as a "kernel" on the right eye. He has experienced no difficulty, save periods of ocular irritation. General health—good. No venereal history.

Examination. — Vision: $\frac{6}{12}$. Wassermann — negative. Tuberculin—negative. In the lower temporal quadrant of the cornea from 6 to 9 on the clock dial, is an uneven growth, elevated less than a millimeter, which extends in an irregular curve forward on the cornea in width varying from 2 to 3 millimeters. The corneal tissue at the border of the growth shows an ill-defined cloudy zone in the stroma like that observed in pterygium. The superficial epithelium is intact save at the crests of three nodules: this being the only area taking fluorescin stain near the border. At the limbus, the growth appears thinner than on the cornea, but there is a wedge-shape area of thickened bulbar conjunctiva which is apparently continuous with the episcleral tissue underneath, in as much as the invaded conjunctiva does not move freely. The mass is striated with engorged conjunctival vessels which converge to the corneal cone. Iris—normal. Under local anæsthesia at the Buffalo General Hospital, the growth was removed according to the method described which included the entire wedge of conjunctival and episcleral tissue. The area covered with conjunctival flaps from above and below. Healing was prompt and kindly. Discharged in two weeks. Uncorrected vision: $\frac{6}{12}$.

Pathological Report.—Microscopic examination shows an irregular thickening of the epithelium, which is rather papillar in some places, and in other places dips down, destroying Bowman's membrane, and shows some slight infiltration into the substantia propria. The cells are irregular in shape, showing hyperchromatic nuclei and a few mitotic figures. There are certain areas showing marked subepithelial round cell infiltration with formation of new capillaries in the substantia propria. The tumor formation apparently remains superficial, and spreads laterally rather than a tendency to an infiltration of the connective tissue layer. Microscopic diagnosis-epithelioma.

On September 21, 1915, the patient presented himself for inspection. Healthy scar formation replaced the site of the epithelioma. However, on the lower nasal quadrant one millimeter behind the corneoscleral junction there was observed a small oval subepithelial nodule, apparently in the conjunctiva. This, along with a generous area of conjunctiva was excised and the episcleral tissue removed. The conjunctival gap was closed with silk sutures. This case was seen at intervals until his death at 81, five years later with no evidence of recurrence. Vision remained $\frac{6}{12}$ (uncorrected).

Case 3.—Frank L., age 31, Jamestown, N. Y., No. 9648, metal worker. Seen on January 10, 1916. This case was referred to me by Dr. H. S. Reger of Jamestown with the following history: Three years previously, he developed a sensation of foreign body in the left eye. A few days later noted an unusual appearance. There is no history of discomfort. Denies venereal infection. General health—excellent. Wassermann—negative. Tuberculin test O. T. negative. Tension normal to fingers. O.D.V. $\frac{6}{5}$. In the upper nasal quadrant of the cornea, extending from 8:30 to 1:30 on clock dial, is an irregular mass extending 5 millimeters on to the cornea at its widest point. There is a tendency to nodular formation. The superficial epithelium is intact, there being no staining with fluorescin. There is a faintly clouded zone in the cornea like that seen in pterygium. The mass apparently extends deeper into the stroma than the other cases seen. There are two leashes of conjunctival vessels, the smaller from above and the larger extending from the pinguicula to the center of the mass. The conjunctiva is thickened nearly to the caruncle and is only very slightly movable over the sclera.

Under local anæsthesia at the Buffalo General Hospital, the mass was extirpated as described above. In my anxiety to remove as much of the corneal tissue as possible, I perforated into the anterior chamber with tip of my keratome and a few drops of aqueous escaped. The wound was evidently a small one for the next day there was no leakage. The wound healed uneventfully.

Pathological Report.—Marked thickening of the corneal epithelium with areas showing a papillar formation. The cells are fairly regular, and while the nuclei are somewhat hyperchromatic, still this is not marked. There is no tendency to infiltration of the subepithelial connective tissue and mitotic figures were absent. There was marked proliferation of the subepithelial connective tissue, with new vessel formation and some infiltration with round cells. Diagnosis epithelioma, probably of a low degree of malignancy. The case was kept under observation at intervals by myself and Dr. Reger, being last seen by me in July, 1917, at which time there was a smooth flat flap of conjunctiva. Meantime, however, he has been under the observation of Dr. Edward Stieren of Pittsburg who kindly furnishes me with the following data under the date of February 18, 1921.

"In regard to Frank C., whom I first saw August 14, 1916, there was then and is at present a flap of conjunctiva covering the upper, inner third of the left cornea. The remaining cornea is transparent and clear as are all the media.

R. V. $\frac{6}{4}$—homatropin. R. V. $\frac{6}{6}$—: $+$ 0.12 sp. $\supset$ $+$ 0.37 cy. ax. 45 V. $\frac{6}{4}$; L. V. $\frac{6}{12}$—homatropin. L. V. $\frac{6}{15}$ $+$: $+$0.25

sp. $\supset$ + 4.00 cy. ax. 55 V. $\frac{6}{5}$; 12 degrees of esophoria: 10 degrees left hyperphoria.

"There is a limitation of the left globe outwards and downward but he enjoys binocular vision having learned to turn his head to the left when looking to the left and depressing his head when reading. With this exception the eye does not give him the slightest concern.

"Enclosed please find the photographs taken of his condition. They are failures in my estimation as they make the conjunctival flap look as though it were raised which is not the case as it is perfectly flat and as pale as the conjunctiva surrounding it. The enclosed sketch shows the condition better.

"I think there will be no further contraction of the flap with consequent increase in astigmatism as his refraction has remained the same in the left eye for the past two years. It is interesting to note that at the first refraction September 2, 1916, there was but 1 D. of hyperopic astigmatism, axis 60."

Case 4.—R. W. G., age 73, No. 16205, Mt. Alton, Pa., farmer. December 3, 1919. About seven years ago, patient noticed a small spot on the nasal side of his right eye which was irritated for a few weeks and then quieted down. At long intervals, the eye has been mildly uncomfortable but the patient has suffered no serious inconvenience. Lately, however, he is quite sure that the spot is increasing in size. This later observation is confirmed by his wife. No history of venereal infection, several healthy children. General health is excellent. Vision: $\frac{6}{12}$ + 0.75 sp. $\supset$ + 0.75 cy. ax. 30; V. $\frac{6}{7.5}$, Wassermann—negative. Tuberculin O. T.—negative.

In the nasal quadrant of the cornea, extending from 2 to 5 o'clock, is a slightly elevated growth with small nodules. The growth is not movable. There is a narrow opaque cloudy zone in the deeper corneal layers, like that seen at the head of pterygium. The nodular edge takes a faint fluorescin stain. The conjunctival area is thickened and is slightly adherent to the sclera beneath but not immovable.

Under local anæsthesia, the mass was removed according to the technique outlined.

Healing was prompt. Patient was kept under observation two weeks and sent home.

I have seen him at varying intervals since. When last seen, a few weeks ago, there existed a firm white scar with no diseased tissue. Slight limitation of excursion of globe, outwards. Vision: $\frac{6}{7.5}$.

Pathological Report.—Marked thickening of the surface epithelium in areas, with loss of epithelium in other areas. The cells were large, irregular, showing hyperchromatic nuclei, but no mitosis. In certain areas Bowman's membrane was entirely destroyed. There was slight subepithelial round cell infiltration. At the areas where the tumor cells were destroyed, there was some infiltration with polynuclear leucocytes.

Diagnosis.—Epithelioma of the cornea.

Summary.—Epithelioma of the limbus is usually of the slow growing non-malignant type, which in its early life remains superficial, with no great tendency to invade the deeper structures nor to metastasis. This type of neoplasm is favorable for surgical attack. The surgical problem is the same as for any other portion of the body: extirpation and replacement by healthy tissue. The technique employed on three cases reported endeavors to conform to surgical fundamentals.

CONCLUSION.

It is not the purpose of this paper to contrast the results of surgery with those obtained from radium, nor to minimize the brilliant results obtained with radium or underestimate its value. I am simply reporting the results of my experience with epithelioma of the limbus and presenting the surgical phase of the problem. I desire to express my thanks to Dr. Burt Simpson of the State Institute for the study of malignant diseases at Buffalo for the pathological reports and to Mr. W. C. French of Philadelphia for the illustrations of the surgical technique.

THE CORNEAL SUTURE IN CATARACT EXTRACTION.[1]

By Dr. E. C. ELLETT, Memphis, Tenn.

THERE are times in the experience of every operator when he must have felt that it would be a decided advantage to have a means of closing the generous incision into the eyeball that a cataract extraction demands, and many attempts have been made to devise such a means. These attempts have been one of two kinds, either the insertion of some sort of a suture in the ocular tunics, or in the preservation of some sort of a conjunctival bridge or flap to maintain a connection between the lips of the wound.

Sutures have been either conjunctival or corneal. Conjunctival sutures are usually meant to be inserted at the completion of the operation. If all has gone well, one does not need them, and if things have gone badly, it is much better not to prolong the manipulations by endeavoring to insert them. The same might be said of those forms of corneal suture which it is proposed to place after the operation is completed. Through and through corneal sutures have seemed so objectionable that I have never employed them, and cannot therefore discuss them. Of the forms of corneal suture placed on the "in and out" plan, my experience is limited to the technique proposed and practiced by Prof. Kalt of the Quinze-Vingts Hospital in Paris, and my interest in this technique followed a visit to his clinic in 1910, the favorable impression being strengthened by a second visit in 1913. Kalt's last paper, in the *Annales d'Oculistique*, June, 1910, contained a report of two thousand cases, a sufficient number to command respect.

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[1] Read before Section on Ophthalmology, New York Academy of Medicine, April 21, 1921.

The presentation of two papers on this subject on previous occasions, the last to the section on ophthalmology of the A. M. A., nine years ago, have been the media of expressing my personal impressions of the value of the corneal suture in cataract extraction, impressions which the lapse of time and added experience have not changed.

It seems to me impossible to carry out the technique satisfactorily unless one is provided with the proper materials, which I have not been able to obtain anywhere in this country. The needles are round, very fine, and perfectly pointed. The thread is a special one of silk or cotton, iron dyed, and a little finer than 00.

The method of placing the suture can be best described in Kalt's own words, and this description is quoted because it is exactly the procedure upon which the conclusions of this paper are based.

"I pass the needle into the cornea, in the vertical meridian, about 1*mm* below the limbus, the point, without penetrating into the anterior chamber, emerges at the juncture of the opaque border, and the thread is drawn through. Then the needle is introduced about 1*mm* above its point of exit into the episcleral tissue, as is done in the muscular advancement. As soon as I find that the point has penetrated into the resistant tissue I bring it out again, in order to involve as little of the tissue as possible. As it is impossible to bring the needle out at right angles, about 2*mm* of conjunctiva is loaded on it, which is of no consequence. In drawing this thread I leave a loop which is placed sideways toward the nose and spread out carefully to avoid twisting." "The whole forms a T, with a gap between the junction of the horizontal portion with the vertical portion." "An interval of .5*mm* corresponding to the limbus, is ample to permit the passage of the knife."

After placing the suture, it is well to have the lower end lie straight downward, the upper end straight upward, and the large loop lying on the nose well out of the way. The suture does not, of course, come in contact with the skin, but lies on the gauze mask which surrounds the field of operation. By wetting the thread with a sterile solution it can be made to adhere to the gauze sufficiently not to curl up and get in the way.

The fixation, corneal incision, capsulotomy and delivery of the lens follow in the usual manner. Those steps, as well as the iridectomy, are according to one's usual technique. The incision at the limbus can easily carry a little conjunctival flap on each side of the stitch, but the apex of the incision is wholly free of conjunctiva.

In regard to the capsulotomy, Kalt uses the capsule forceps which bear his name. Sometimes they will fail to grasp the capsule, and a cystotome must be employed. Sometimes they grasp the capsule, which does not tear but gives a secure hold by which the zonule can be ruptured and the lens delivered in its capsule, as advocated by Stanculeanu, Arnold Knapp, and others. Usually a large portion of the anterior capsule is removed in the bite of the forceps, which facilitates the delivery of the lens and lessens the incidence of secondary cataract.

If one adheres to the Kalt technique, he will not perform an iridectomy. Full mydriasis before the operation renders it easier to do the simple extraction, and also lessens the tendency to iris prolapse. This unpleasant complication occurs, I believe, in from ten per cent to twenty-five per cent of simple extractions. In the last 1100 published cases, Kalt had it occur in 3%, but I have not been able to approach this result. In the 249 cases of extraction with suture of the cornea on which this paper is based, 223 were simple extractions, and prolapse of the iris occurred 24 times. I have counted as prolapse every case in which the slightest discoloration from uveal pigment occurred in the line of the incision. Sometimes it was a frank knuckle, visible the day after the operation. Sometimes it was a small point appearing several days after operation, and either remaining stationary for a while, and then receding, or increasing in size. An iridectomy was performed for prolapse of iris 15 times (6.75%).

Although a digression, it is probably proper to speak of the character of iris prolapse that may follow the operation with corneal suture. It is small and lies obliquely, to one side of the stitch. For some reason inflammatory action and the resulting adhesion is slow to take place, and if excision is done, it is easily done, and the pillars can be readily dressed back into place, so that the coloboma, except for its oblique position, is quite as regular and satisfactory and pleasing to the eye as one deliberately made as a step of the extraction.

While the occurrence of iris prolapse may be explained by the physics of pressure of the aqueous, it is hard to tell why it occurs when it does. One of my early cases was a woman with chronic nephritis. On the night of the operation she had two uremic convulsions and was unconscious several hours, but she did not have an iris prolapse, and recovered from the uremia with a perfect cosmetic and visual result. On the other hand I recently operated on a most tractable and satisfactory patient, an old colored woman, whose behavior during and after the operation was above reproach, yet she had a small prolapse the day after the operation, which so increased in size by the next day that excision was considered advisable. To digress a little further, it is a surprise to see prolapse occur a week or more after satisfactory reëstablishment of the anterior chamber, and this is usually, I think, due to some traumatism, which will not always be confessed.

As soon as the lens is delivered, the suture is drawn up and tied. I prefer to tie the first twist double, the so-called surgeon's knot, since it does not slip. A loosely tied suture is of no use, and it is well to tie it tight enough to produce a little wrinkling or puckering of the cornea. It has been argued that a suture passed in this way will, when tied, produce an inversion of the edges of the wound, but this has not been my experience, as the cornea is stiff enough to prevent it.

Should there be at the time of delivery of the lens, a loss of vitreous, one of the great advantages of the stitch is manifest. Vitreous loss is, of course, a thing which is viewed with varying concern, but probably most of us prefer not to lose any vitreous, or if we must lose it, prefer that the loss be small, and that we do not have to leave the eye with a large bead protruding from the wound. The good results that follow in many such cases are well known, but that does not alter our chagrin at the accident. To see the protruding bead recede, and the edges of the wound approximate as the suture is tightened is a most gratifying experience, and a sight that would make many converts to the use of the stitch. As Kalt says, "Once the suture is tied, one is master of the situation."

The toilet of the wound is now made. As a factor in making possible a safe, deliberate and thorough toilet of the anterior chamber and wound, lies the strongest appeal of the corneal stitch. It is generally believed that nothing so contributes to the prompt and uneventful recovery of an eye after a cataract extraction as the thorough removal of all lens matter. It does not seem possible to avoid leaving some of it behind in delivering the lens unless the lens is removed in the capsule. If some remains, as is usual, the removal of this material is accomplished in various ways by different operators, manipulation with spatulæ, irrigation, and the use of the suction curette being the more usual ways. The latter is the method employed by Kalt, and since the wound is closed by the suture, it seems the easiest plan under the circumstances. It appeals to me as more exact and expeditious, and attended with less disturbance to the eye than the other methods. The suction is continued till the pupil is clear and black, when the iris is dressed into position, and the conjunctival flaps, if any, are smoothed out. Not only is thorough removal of all lens matter at the time of operation a factor in lessening the post operative reaction, but it also seems to lessen the incidence of secondary cataract. The secondary cataract is, of course, largely composed of capsular remains, but cortical debris, and the inflammatory products which result from any considerable reaction add to the density of the membrane. It has seemed fair to attribute the small number of secondary operations in this series to the careful toilet which this technique permits. In the 249 cases, a secondary operation was performed 42 times. The exactness of these figures from a percentage point of view is discounted by two factors, one being that certainly some of the cases should have had secondary operation which did not have them, and in some of the cases more than one secondary operation was done. A few of the secondary operations were done, not for capsular opacities, but for adventitious hyaloid membranes.

The operation completed, the customary dressings are applied and the patient returned to bed. The cases in this series were inspected at the end of 24 hours, and usually the anterior chamber was found to be reformed. The patient was then permitted to get up and the dressing left off the unoperated eye, provided it possessed any vision. This practice may not meet with general approval, but it was followed in these cases without there being any cause for regret.

At the end of 48 hours the eye is again dressed and the stitch removed. This is done with local anæsthesia and with the patient lying down to guard against any sudden movement when the stitch is drawn upon, as it must be in its removal. This little maneuver is executed with due regard to cleanliness and gentleness, and with the eye anæsthetized and properly illuminated. The stitch is removed at this time because it has served its purpose, and it is best to get rid of it. It might be removed sooner, it might be left in longer, and sometimes is. It is rather surprising that it causes so little irritation. One case, operated on in June, left the hospital for some reason without having the stitch removed, and returned in November, five months later, for a secondary operation, the corneal arm of the stitch having cut through, but the loop still hanging to the eye, attached by its scleral portion. The eye was only slightly red, and no ill effect had been occasioned by the long retention of the stitch.

It is argued that the removal of the stitch is practically a second operation, disturbing, terrifying and full of risk. It need not be. It is not necessary to tell the patient that he has a stitch in his eye that must be removed till the time comes to remove it, and the stage is set. The announcement then causes no surprise, since to the lay mind stitches and wounds are closely related, and it seems not unnatural that one has been necessary in this wound.

It has happened that sudden movement or squeezing of the lids has emptied the anterior chamber of aqueous during the removal of the stitch. I do not recall any serious results from such an accident. In any event, the dressing is reapplied after removal of the stitch for at least another twenty-four hours.

It has been thought that the presence of the stitch would not only increase the irritation, but even favor infection of the eye. In a good many of these cases the stitch was transferred at once, upon removal, to a tube of culture medium, and in no case was anything grown more formidable than a staphylococcus. The eyes in which the stitch is used show no more irritation than other operated eyes, and as regards infection there were two eyes lost in the 249 from this cause, which is about the average percentage. In another case, a ward patient, up and about and with no dressing on his eye, washed his face at a sink and fished some soiled surgical dressings out of a waste can and wiped his face on them. The eye became infected and was lost, but it seemed hardly fair to attribute this to the operation.

It might be well to recapitulate here a sort of statistical table of the cases of extraction with corneal suture on which this paper is based. They were, as has been stated, 249 cases. Of these there were 54 in which no record of the visual result was made, for reasons that will obtain in any series. Of the eyes in which the vision was recorded, the following were the results:

20/20—71 cases		20/80— 3 cases
20/25—46 "		20/100—5 "
20/30—19 "	Less than	20/200—2 "
20/40—20 "		P. L. 3 "
20/60—15 "	No vision	7 "

The eye was lost from suppuration in two cases. One eye was enucleated for subchoroidal hemorrhage, iridocyclitis and sympathetic ophthalmia in the other eye. One eye was enucleated for iridocyclitis and secondary glaucoma. Eight eyes showed marked iridocyclitis.

There was loss of vitreous in 18 cases.

Prolapse of iris in 24 cases.

Sixty of the cataracts were immature.

Thirty-two lenses were extracted in the capsule.

Forty-two secondary operations were done.

In 223 cases, simple extraction was performed. Excision of prolapsed iris was done 15 times (6.7%).

The cases were not selected, but were those in which the operation was not deemed inadvisable for any reason. Those reasons will not be discussed because I am not prepared to state any contraindications for the use of the suture, though its use may be inexpedient. For instance, I would not use it when the removal of the stitch would have to be left to inexperienced hands. Kalt says it is indicated in all cases except those showing posterior synechiæ, but at my last visit to his clinic I noticed cases in which it was not used whose records had a note of "lachrymation." I did not have an opportunity to discuss this point with any member of his staff.

What, then, may be said against the operation with corneal suture, and what advantages can be argued in favor of its use. The objections to the suture are that it adds a step to the operative manipulations in its introduction, and another in its removal. In these respects the insertion of a suture is open to less objection than the performance of a preliminary iridectomy, a procedure which is considered justified in many cases. I do not think its presence increases the irritation following the operation, or the liability of infection. Kalt says the suture is contraindicated by posterior synechia.

The advantages of the suture are:

1. It reduces the likelihood of vitreous loss, or at least of considerable vitreous loss, to a minimum.

2. It permits simple extractions with a smaller percentage of iris prolapse, or if iris prolapse occurs, it limits its extent.

3. It promotes early closure of the wound, and enables the patient to get out of bed earlier.

4. It enables one to make a more thorough and deliberate toilet of the wound. In this way it lessens the incidence of secondary cataract, and also encourages and justifies operation in immature cataracts. If it can be made generally known that some immature cataracts are safely operable, it will tend to reduce the number of patients who are advised to wait until the cataract is ripe before they seek relief, and the result will be to bring many patients with preventable blindness to consultation at a time when relief is possible.

CONGENITAL ATRESIA OF THE PUNCTA LACRIMALIA OF ONE SIDE.

By Dr. HARRY GRADLE, Chicago.

CONGENITAL closure of the conjunctival openings of the lacrimal canals is reported to be fairly common, but descriptions of such anomalies do not appear very frequently in the literature. Manz wrote that in several instances, the puncta lacrimalia were found closed by a fine membrane, although the tear passages proved to be permeable. In the second edition of the same Encyclopedia, von Hippel mentions that there has been described an atresia of the puncta with patent canaliculi and normal relations of the remainder of the tear passage. The resultant epiphora was relieved easily by simple perforation of the epithelial cover that closed the mouths of the canals. Hansell claims that congenital absence of one or both puncta is fairly common, but does not differentiate between atresia and complete absence. None of these authors cite either cases or case reports to substantiate their statements. Individual cases of congenital atresia of one or more puncta are reported by Ferron, Nielsen, Lebegne, Bernhardt, and Webster Fox. The case reported by the latter author was of particular interest because of the lack of epiphora for more than twenty years, despite complete congenital absence of both of the lacrimal points of one side.

The following case is the only one of this character that I have ever seen:

Miss W., a nurse, age 21 years, complained of continuous lacrimation of the left eye. This condition had been present since her earliest recollection. There was no discharge from the eye and the lacrimation was excessive only under very irritating conditions of wind and weather.

The right eye was normal in every respect. Neither upper nor lower lids of the left eye showed any thickening or abnormality whatsoever. The conjunctiva, both tarsal and bulbar, was normal. The lacrimal puncta were seen as small dark points in the normal location. Attempts to insert a punctum dilator were unsuccessful. Under three diameters magnification, the openings of both upper and lower puncta were found to be covered with a thin layer of normal epithelium, some few cells thick, such as is found along the margin of the lids. This epithelial covering was broken with the point of a Graefe knife, held at right angles to the lid margin, and twisted upon its own axis, after the point had been forced through the epithelium. A punctum dilator was then inserted and the lacrimal points enlarged. Lavage with salt solution showed a clear passage into the nose, both from upper and lower puncta.

Three days later, she reported that only on one occasion had there been any overflow of tears. The dilatation of the puncta and lavage were repeated, but it was unnecessary to use any sharp instrument as the puncta had remained patent. This relieved the epiphora and there has been no return of that condition during the past four months.

This congenital atresia was evidently due to a failure of perforation of the lid epithelium before birth. In the embryo about six weeks old there is found a naso-lacrimal groove. This lies in the position that in the adult would correspond to a line drawn from the internal canthus to the junction of the lip and the cartilaginous ala of the nose. From the deepest epithelial cells of this groove, a cord of ectoderm, corresponding to the lacrimal passage, arises and forms a lumen. The lower end opens into the nose, while the upper end divides into two passages that eventually open into the puncta lacrimalia. At first these lie near the middle of the palpebral fissure, but are gradually drawn toward the internal canthus, pushing before them tarsus and conjunctiva. By the time the puncta have assumed their position of adult life they have gathered a mass of tissue before them which develops or rather retrogrades to form the caruncula lacrimalis. The naso-lacrimal groove eventually disappears.

The condition is not serious and merits but little discussion. In the treatment the endeavor should be to do as little as possible consistent with the restoration of function and slitting the canaliculus, a procedure that is indulged in altogether too indiscriminately, is entirely unnecessary.

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REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. CONRAD BERENS, Jr., Secretary.

MEETING OF FEBRUARY 21, 1921. DR. L. W. CRIGLER, CHAIRMAN.

Doctor C. R. Stockard, Professor of Anatomy, Cornell Medical College, read a paper, **The Eye in Normal and Abnormal Development.**

The eye is the first actual organ to make its appearance in the embryo. In the early embryo the ectoderm of a definite region thickens to outline the future central nervous system, and in the antero-median portion of this neural plate the optic fundament arises. As the neural plate folds its lateral borders upward the optic vesicles grow ventro-laterally as diverticula from the neural tube. The optic vesicles thus appear before the primary brain vesicles have widened out. The early optic vesicles are proportionately of enormous size and evidently a considerable amount of developmental energy is consumed in their origin and outgrowth from the embryonic brain.

These early organs constituting a large part of the entire embryo are the simple beginnings of only the retinal portion of the eye. The fundament of the crystalline lens very soon arises from the skin ectoderm overlying the optic vesicle, and the lens and optic cup then continue their development in close association. From this time throughout embryonic life and during almost all of fœtal existence, accessory parts are being added to the primary retinal cup. Few organs in the body are so continuously adding to themselves and undergoing such important developmental processes through so extensive a period as is the eye.

During this long developmental time the central portion of the retina is differentiating its numerous cell layers. The anterior periphery beyond the ora-serrata becomes modified to form important portions of the corpus ciliare and pars iridica. The mesenchyme surrounding the retinal cup is continuous with the mesenchyme of the cornea and from it is derived the choroid coat, the sclera, the tunica vasculosa lentis, and portions of the corpus ciliare and iris. The lids, conjunctiva, lacrimal glands and other accessory glands and ducts originate from the overlying skin. Muscles destined to move the eyeball and lids are at this time being differentiated from the mesoderm, and nerves and vessels are growing out and forming to supply these numerous parts. The fibers from the retinal ganglion are growing in a direction to focus on the optic stalk and these fibers then follow the stalk back into the brain producing the optic nerves and primary optic tracts. From the brain cells about which these fibers end other fibers grow away and pass as the secondary tracts and optic radiations to the cortical centers of vision.

The large size of the primary eye, the numerous structures which become secondarily associated with it in development, and the long embryonic period during which these structures arise and differentiate, tend to render the eye liable to numerous arrests and defects in its development.

In studying experimentally the development of a number of organs I have found that unfavorable environmental conditions tend to slow in particular the rates of development of those organs which are rapidly forming at the given moment. An organ is most susceptible at the instant of its origin. When the embryo is subjected to a low temperature or deprived of oxygen at a certain developmental period, those parts which are then developing most rapidly will be injured, while other parts which are developing slowly will escape marked injury. If an early embryo be subjected to a low temperature at the moment when the optic vesicles should arise from the neural tube the vesicles will be suppressed. When such an embryo is returned to a favorable temperature it resumes development, but is either entirely unable to develop the optic vesicles or else it develops them in an abnormal fashion. This simple experiment permits one to induce complete anophthalmia, microphthalmia, monophthalmia asymmetorica, or cyclopia. Arresting development at later periods will modify the expression of accessory parts of the eye.

On account of the long developmental time during which the various parts of the eye are being formed, it is rather difficult to interfere to any marked extent with the embryonic development of an individual without in some way injuring the eye. Thus the final condition of the eye becomes a most valuable index in estimating the degree of perfection in the development of an individual. Almost any arrest which the developing embryo may have suffered will show its effect in some manner on the ophthalmic structures.

Since in origin the eye is actually a portion of the brain or central nervous system, its quality of development is intimately associated with a similar quality of development on the part of the central nervous system. Thus in degeneracy of the nervous system and maldevelopment of the brain, in feeblemindedness and similar congenital conditions, one would anticipate certain structural defects in the eye, or at least an eye below the normal in its functional capacity.

Through experimental studies the writer has found that almost all of the accessory parts of the ophthalmic apparatus, crystalline lens, lids, conjunctival sac, lacrimal glands, extrinsic muscles, 3d, 4th, and 6th nerves, secondary tracts, etc., are capable of arising and differentiating normally in complete absence of the primary optic cup or retina. The forces regulating the normal adjustment and coördination of these parts in the presence of the retina are not fully understood at the present time. It is hoped that after more complete and detailed analysis the experimental studies of the development of the eye will furnish valuable explanations of many frequently found ophthalmic deficiencies.

DISCUSSION: DOCTOR E. UHLENHUTH agrees with Doctor Stockard as to the importance which the lowering of the temperature has in the development of certain organisms. In the case of the fish exposure to low temperature, at a certain stage, and the interruption of development resulting from it leads to the formation of structures pathologic in that they decrease the fitness of the organism for life. In other species, however, exposure to low temperature results in structural changes which do not reduce the individual's fitness for life and may lead to the production of new races. Such is the case with the larvæ of the tiger salamander. The chemical processes causing development of different structures are not equally retarded, in this species, by exposure to low temperature, a condition which frequently occurs in the natural habitat of this species. Thus, by exposure to low temperature, development of certain organs of the larvæ of the tiger salamander is retarded more than the development of other organs, and an organism results in which some organs possess adult structures, while others are in a completely larval condition. Since the development of a peculiar mechanism necessary for the function of the thyroid gland is especially much retarded, these animals, as a whole, may remain infantile, while the sex organs which are among the least retarded structures, may, at the same time, reach maturity. Consequently exposure to low temperature, in this species, gives rise to a peculiar race defective in many ways as compared with normal animals, yet perfectly fit for life and even capable of reproduction.

Doctor Stockard explains the anomalies of the fish eye and the formation of double monsters on the ground that the entire process of development is composed of a series of successive budding processes. In accordance with Loeb's findings in the plant Bryophyllum calycinum he explains the normal succession of these budding processes by assuming that each bud at the time of its formation attracts, by some peculiar mechanism, most of the growth-promoting substances available in the embryo and thus by depriving them of the necessary substances prevents, for a time, growth of the other buds. If at this time the activity of the growing bud is checked by exposure to low temperature, the bud, after being returned to normal temperature, is not able to regain its dominance over the other buds and consequently the organs which develop from the suppressed bud become defective, the other buds growing out precociously and taking in their turn some of the substances which would have been necessary for normal development of the suppressed bud. One of the most peculiar budding processes is the regeneration of the amphibian lens in that this organ, after its removal from the eye, always regenerates by the formation of a bud growing from the upper edge of the iris in a downward direction. The latter peculiarity has been claimed to be the expression of the forces of gravitation. I have shown, however, that this assumption is incorrect; for if the eye is inverted by transplantation, the lens again grows, after it has been extirpated, from the normal locus, now the lower edge of the iris, and thus regenerates against the forces of gravitation, in an upward direction. Hence I am inclined to assume that the upper edge of the iris represents the apex of the bud which, in the development of the eye, gives rise to the eye cup, and that the remaining edge of the iris although capable of the regeneration of a lens can not give rise to a lens because the apex located in the upper edge of the iris like the apex of Bryophyllum calycinum (Loeb) or, at definite times, the buds along the main axis of the fish embryo, is capable of attracting quickly the substances necessary for growth and thus gains an advantage over the other places of the edge of the iris before they can grow out. In the light of Doctor Stockard's experiments it appears to me that this assumption could be tested very effectively by exposing the animals, soon after the extirpation of the lens, to low temperature, as this procedure should prevent the upper edge of the iris from regaining its advantage over the other parts of the iris, when the animals are returned to normal temperature, and consequently lenses should regenerate from several places of the iris after a temporary stay in low temperature.

Doctor Stockard has laid special emphasis on the quantitative changes of metabolism resulting from lowering the temperature, which he believes to be the real cause of the specific changes of the structural expression following the lowering of the temperature. This assumption deserves special attention as our interest in the action of the morphogenic hormones centers at present precisely in the question whether these hormones produce all the innumerable structures characteristic for the action of them by bringing about specific changes in the kind of metabolism or by merely changing the rate of metabolism. The latter mode of action has been emphasized especially in the study of the thyroid action.

Doctor Stockard has pointed out that the structures of the eye require an especially high metabolic rate for their expression and that consequently all factors lowering the rate of metabolism readily lead to disturbances in the development of the eye. That this is the case has been shown many years ago by Jacques Loeb who was able to produce blind fish by cutting off the oxygen supply. It is well known that lack of the thyroid function likewise results in a characteristic and considerable lowering of the metabolic rate. For this reason one feels much tempted to explain the atrophy of the eyes of the blind Texan cave salamander (*Typhlomolge rathbuni*) on the basis of the lack of the thyroid gland prevailing in this species of salamanders rather than by assuming that lack of light could have suppressed eye development in this cave-dwelling animal.

In this connection it should be remembered also that E. Steinach was recently reported to have abolished senile cataract by reviving the activity of the interstitial gland, a procedure which likewise results in a general rise of the metabolic activities of the organism.

DR. FRIDENBERG said that he thought ophthalmologists are interested in biological rests, particularly with pigment abnormalities. For example, retinitis pigmentosa, retinitis pigmentosa sine pigmento, albinism, other changes (blue scleræ where bones are brittle, congenital corneal defects, maldevelopment of lens, in heterochromia). In endocrine organs we may find the key for many of these changes.

DR. STOCKARD in closing the discussion said morphology and biology are equally important. Every morphologist must be an analytical biologist. All biological things have a morphological background. If we know structural reasons for a thing, we are beginning to get to the bottom of the problem. He believes morphology is in its infancy and we should get to a structural background even in pigment abnormalities. Nothing is really biological until it is first morphological or has a structural basis.

DR. C. E. FERREE and DR. G. RAND, Experimental Psychologists at Bryn Mawr College, read papers on (I.) **The Variable Factors which Iufluence the Determination of the Color Fields** and on (II.) **An Illuminated Perimeter with Campimeter Features.**

I. The variable factors which influence the apparent limits of color sensitivity are the wave-length and purity of the stimulus, the intensity of the stimulus and the visual angle, length of exposure of the eye, the method of exposure (moving or stationary stimulus), accuracy and steadiness of fixation, the intensity of the general illumination of the retina and its state of adaptation, breadth of pupil, and the brightness of the preëxposure and surrounding field. The most important of these from the standpoint of the office and clinic are the intensity of the stimulus, the brightness of the preëxposure and surrounding field, the intensity of the general illumination, and the accuracy and steadiness of fixation.

By a sufficiently wide variation of intensity alone the fields of color sensitivity may be made to have almost any breadth within the field of vision, to differ radically in shape and even to change or reverse their order of ranking as to breadth. The limits for pigment stimuli may be either interlacing or concentric in the order from widest to narrowest of red, blue, and green; or of blue, red, and green; depending upon the intensity of light falling on the perimeter arm. Without great precision in the control of intensity, it is obvious that reproducibility of result can not be obtained and little significance can be attached to extent or shape of field, to order of ranking as to breadth of field, or to any variations from time to time or from person to person in these important features.

II. This instrument was devised in response to a request made by the American Ophthalmological Society for a feasible means of illuminating the perimeter arm with light of a good intensity and quality, so that every point on the arm in any meridian in which it may be placed shall receive equal intensities of light. Intensity and quality of illumination, however, are only two of the factors which influence the results of the perimetric determination. In devising the instrument described in this paper, it has been the purpose of the writers to provide a control also of other factors which are of importance in the work of the office and clinic.

Other novel features of the instrument are a tangent screen for the mapping of the normal blind spot and for the quick detection and mapping of central and paracentral scotomata, and a device for controlling the fixation of patients who have a central scotoma or pathological blind area. The tangent screen can be quickly and conveniently attached to the stimulus carriage and moved into position. When adjusted for work it is the same distance from the eye as is the perimeter arm in taking the fields and receives at the point of work always the same uniform illumination.

Discussion: Dr. J. W. White has always felt that the fields we took for color were not valuable as we took them. For seven years Dr. Duane and he have not taken color fields. They have depended upon the field for form. They use the blind spot for holding fixation where central scotomata exist, when taking the field on the tangent curtain or, preferably, the complimentary color test which could be used on the perimeter as well as on the curtain.

Dr. Fridenberg suggested stereoscopic fixation and spirit level for determining the horizontal.

MEETING OF MARCH 21, 1921. DR. L. W. CRIGLER, CHAIRMAN.

Dr. Knapp presented a case of **deformity of eyelids following anthrax.** The patient, aged 16, on December 23, 1920, noted a pimple in the lower eyelid. This was rapidly followed by a great swelling of the lids, fever, and prostration. As there was discharge from the nose a frontal sinusitis was diagnosed and an operation attempted by a rhinologist. After making the incision the subcutaneous tissue was found unusually dry. The operation was stopped and a culture taken, which gave anthrax. Antitoxin was given intravenously and locally about the swollen lids.

Two weeks later, there was an area of gangrene involving both lids, joined together at the outer angle in the shape of a horseshoe. This became demarcated and sloughed away, so that at present the lower lid is entirely gone, except for the line of eyelashes, which is directly adherent to the orbital margin; the upper lid is about half its normal size and the skin at the external angle is a congested, thin, atrophic scar. The eye, except for chemosis of conjunctiva, is normal.

Suggestions on the proper restoration of the lower lid were invited.

Discussion: Dr. Wheeler said that he thought it would be possible to correct the deformity of the left lower eyelid by a graft from the right upper lid. It is possible to take a graft from the upper lid 50*mm* long and 20*mm* wide, and it is not necessary to allow for contraction as is the case with grafts taken from other locations. He suggested deferring the repair of the shortened upper lid in order to get the benefit of the exaggerated suspension afforded by the contracted upper lid, after adhesions are made between the lid margins. There is considerable depression connected with the deformity in this case, and it is a suitable case for turning a pedunculated flap from the temple, if it does not seem wise to use the detached graft.

DR. FRIDENBERG said he used a Wolf graft in case of severe burn and suggested its use as there was less chance that the lid would be drawn out of position by subsequent contraction.

DR. J. M. WHEELER showed a case of **Unilateral pulsating exophthalmos. Peculiar enlargement of the sella turcica. Development of bruit four years after accident.**

The patient (A. F. G.) is a male, 31 years of age, a truck driver. He was in a motorcycle accident on October 24, 1914, at which time he fractured his jaw. Transient right facial paralysis and right ptosis followed the accident. Recovery from both was complete, but an annoying diplopia resulted which lasted for 6 or 7 months. Again, in the fall of 1916, following physical exertion, there was an attack of diplopia, which persisted for about 6 weeks. In April, 1918, he enlisted in the army and was discharged December 22, 1918. Two days after discharge, he became ill of pneumonia, and during recovery, the patient developed diplopia again, accompanied by a distressing bruit. Both diplopia and bruit have persisted to this time, but both are becoming less and less troublesome. The patient is driving trucks successfully. At irregular intervals since the bruit developed, there have been attacks of blindness in the right eye, each lasting 3 or 4 minutes.

Present Condition: Vision is $\frac{20}{20}$ in each eye without correction. There is marked dilatation of the bulbar conjunctival vessels, particularly the veins, worse in the left eye. The pupils are equal in size and have normal reactions to light and accommodation. The retinal veins of the left eye are dilated but not tortuous. Otherwise, the interior of each eye appears normal. There is no appreciable dilatation of the veins of eyelids, forehead, or face. There is complete paralysis of the left 6th cranial nerve, with resultant convergent strabismus.

The Hertel exophthalmometer readings are for the right eye 17*mm* and for the left 21*mm*. There is definite palpable pulsation of the left eye, and this becomes visible under slight pressure by the fingers. When the patient leans forward, there is no increase in the exophthalmos. There is a distinct bruit heard everywhere over the head, possibly loudest over the left mastoid region. The bruit can be made to disappear by firm pressure on the carotid. The blood pressure is systolic 115, and diastolic 65. The Wassermann test is negative. The patient is relatively comfortable when he remains quiet, but feels weak and is annoyed by the bruit when he exercises. Dr. George S. Dixon has submitted the following interesting X-ray report: "I beg leave to report in the case of Anthony Gargan that his sella is large, measuring on the plate 12*mm* deep x 18*mm* antero-posteriorly. Measured by the planimeter, and corrected for distance the content is 150sq.*mm*. The dorsum shows considerable erosion behind, including the base of the posterior clinoids, but while they are thin they still retain a long forward curve. That is to say, whatever has been happening, the pressure has been down and back, acting on the posterior part of the dorsum and base of the clinoids without apparent excessive pressure on the upper part of these processes. His frontals are clear and of moderate size. His ethmoids are thickened. The nasal septum is badly deviated to the right. The right antrum is fairly clear, the left cloudy. The lateral plates show all sinus regions cloudy."

There are two important questions which arise for answer. One is whether or not it is advisable to operate for the paralytic strabismus, and the other is whether operation for ligation of the internal or common carotid artery of the left side should be done. Optic atrophy, partial aphasia, and loss of life have been reported as a result of ligation of the carotid, and in many cases only temporary reduction or disappearance of the bruit has resulted.

Discussion: Doctor Arnold Knapp thought that treatment depended upon the patient's symptoms. If he was annoyed by his symptoms the prospects of relieving them by an operation, ligature of the common carotid, were good. He thought it would be a mistake to operate for correction of the strabismus if an operation of ligation was going to be undertaken, as he regarded the ocular paralysis as a mechanical one following the vascular disturbances in the cavernous sinus.

Dr. Wheeler in closing the discussion said that permanent obliteration of the bruit by ligation of the carotid is not at all a certain thing; as near as one can judge from the literature on this subject, permanent cessation of the bruit from ligation has resulted only in the minority of the cases operated on. Furthermore, with the possibility of optic atrophy, partial aphasia, or even death, the advisability of this procedure is questionable, and Doctor Wheeler said he should not consider this a slight operation.

Dr. J. H. Dunnington reported a case of **melanoma of limbus.** The patient (E. R.) is a school boy, aged 15. Following an attack of measles at age of 5, parents first noticed a black spot in the right eye. General physician was consulted, and he reassured them, saying it was simply an unabsorbed blood clot. There was no eye involvement occurring in the measles attack, and no medication other than boric acid was used in the eyes. The mother is confident that no spot existed in the right eye prior to the illness. There has been no appreciable change in size or character of the spot since it was first noticed.

Findings: Vision in the right eye is $\frac{20}{200}$, correctible with a high astigmatic lens to $\frac{20}{40}$+. The interior is normal. There is a heavily pigmented triangular shaped area at the limbus in the lower nasal quadrant. The pigment is irregularly distributed being heaviest at its conjunctival base. The uneven distribution of the pigment gives the spot a smeared appearance as if paint had been daubed with a brush. It measures 3½*mm* in width at its conjunctival base but narrows to a point as the cornea is invaded. It extends 3½*mm* into the cornea and involves the more superficial part of the parenchyma. It is 7½*mm* in length from corneal tip to conjunctival base. The left eye is normal in every respect.

There is a brownish pigmented band around the waist about 3 inches in diameter extending on the left side from midline in back to midline in front. No other pigmented spots on the body or extremities.

Fuchs refers to the occurrence of pigmented spots in the conjunctiva. The most common location is at the limbus. He is of the opinion that while in themselves they are not harmful, they manifest a tendency towards development into melano-sarcomata. These pigmented spots consist of nests of pigmented cells deposited in the conjunctival epithelium. This proliferation of epithelium may assume glandular form. However, in event of growth of these melanomata, the sarcomatous elements proliferate very rapidly and the growth becomes a melano-sarcoma. Parsons described a congenital pigmentation of the cornea as result of an intra-uterine inflammation, causing deposition of uveal pigment into corneal layers. These congenital pigmented corneal spots are usually bilateral and centrally placed.

DISCUSSION: DR. LAMBERT agreed with Dr. Dunnington in his decision to keep the patient under observation.

DR. L. W. CRIGLER asked whether the conjunctiva was movable under this pigment, as he believed this an important point in the prognosis.

DR. A. WIENER presented two cases in which the **cornea had been tattooed** according to the method of von Blascovics. This method which is fairly recent gives most excellent results. One marks out the area either with a trephine or knife, denudes it of the epithelial layer, and then makes his incisions into this area at an oblique angle to the cornea. This should be done only in two directions, and at a right angle. Four or five made in this way suffices. The pigment used is obtained from the soot of a burning candle. This is rubbed into the incisions by means of a spatula moistened with the tears of the patient. A perfectly black pupil is obtained, with only a minimum amount of reaction. The eye can be uncovered on the second day. To those who are interested, the original article by von Blascovics can be read in the *Klin. Monatsblätter für Augenheilkunde*, July number, 1920.

DISCUSSION: DR. H. H. TYSON stated that he disagreed with Dr. Wiener as to the corneal epithelium sloughing off in the other methods of tattooing when the epithelium was not removed, and that if it did it was due to faulty technique. He said that he never removed the epithelium intentionally, and having operated with the Tyson Tattooing needle in about twenty cases, he had never had sloughing occur. He saw nothing new in this operation, unless it was the use of tallow soot instead of the Chinese India ink. In the two cases presented the results were excellent and if the pigment was retained for an extended period they would be all that could be desired. The principal complications of the tattooing operation were (a) the danger of forcing the pigment into the anterior chamber, with probable loss of an eye following; (b) secondary glaucoma in those cases in which an adherent leucoma or anterior synechia exist. In tattooing over the location of the adherent iris, one always produces pain notwithstanding the local anæsthesia, and a mild controllable increase in tension follows, which subsides under the use of miotics. In tattooing, if the pigment is forced into the corneal tissue in an oblique direction, as it should be, most of it will be retained, otherwise it will disappear in a short time. If the Tyson needle is used the first complication mentioned, penetration of the anterior chamber, should never occur, as the needle was devised especially to prevent its occurrence. With proper precautions and asepsis, he considers the operation safe and simple.

DR. FRIDENBERG spoke of a method used recently, of partly removing a flap by means of a trephine and then putting the flap back in position over the ink.

DOCTOR WIENER found, in regard to making a flap, that this was not always an easy matter nor satisfactory. The advantage of the soot taken from the burning candle, is that it is easily obtained absolutely sterile, and equal in every way to the best Chinese ink pigment.

DR. M. URIBE TRONCOSO read a paper on **Recent Methods of Examining the Angle of the Anterior Chamber** for which he suggested the term Ophthalmogonioscopy, and which he regarded as being more comprehensive than "ophthalmoscopy of the angle of the anterior chamber" as called by Salzmann, because other instruments besides the ophthalmoscope can be used for the inspection of the angle. He reported the history of the method, tracing it back to Trantas in 1907, but gives the credit for the decisive step which enables the observer to see all eyes, to Salzmann (1914–1915) who uses a contact glass upon the cornea.

A further improvement has been brought out by Koeppe, who devised a new contact glass provided with a water chamber which must be filled with a saline solution. Koeppe uses instead of the ophthalmoscope the new stereoscopic loupe made by Carl Zeiss (Jena) called "Bitumi" and "Orthobitumi" with which and the Nernst-Gullstrand slit lamp, he obtains a magnification of 20–40 diameters.

Dr. Uribe Troncoso demonstrated the use of Koeppe's contact glass in normal eyes, in conjunction with the electric ophthalmoscope, by the direct method and a + 20 to + 40 diopters in the aperture. The electric ophthalmoscope marks a distinct advancement over the Salzmann method, and although the magnification is not so high as with the Bitumi, nevertheless it is sufficient for ordinary clinical purposes.

Gonioscopy the same as ophthalmoscopy, needs a special training first to obtain a clear image of the angle and then to interpret it; that is, to distinguish between the physiological condition and any pathological changes.

By means of pictures and diagrams, he described the normal appearance of the angle and the anatomic relations of its different structures, viz: the ciliary border of the iris, the ciliary body, its insertion to the sclera in different eyes, the zone of the Schlemm canal and the scleral zone adjoining the cornea.

As the author has pointed elsewhere he has never been able to see the Schlemm canal filled with blood; its contents appear to be a clear lymphatic fluid.

In pathological conditions, especially in glaucoma, gonioscopy is of great value and will find a place after the tonometric examination. In chronic simple glaucoma he has found the angle perfectly free, a fact completely at variance with the accepted views of the ætiology of this disease.

DR. HOMER E. SMITH read a paper on **The Problem of the Immature Cataractous Lens.** A partially opaque lens, speaking generally, presents operative difficulties and attempts for its extraction are not justifiable in view of the immediate risks or the subsequent damage which may follow. Various procedures to mature the lens and so make it readily operable, have been practiced but have failed in their purpose and have fallen into merited oblivion. The choice of operation is between extraction in the capsule and the method the essayist advocates. At some length he goes into the mechanics of extraction in the capsule and contrasts the variants of the original procedure, expression following forcible rupture of the zonula by external pressure, which was practiced by a Jamaican ophthalmologist 150 years ago. The five different methods are dealt with in detail and the difficulties and dangers compared with the simplified method, free from these, of his own operation.

His quotations from other writers are well taken in support of his contention that all which might be attained at great risk from the intracapsular operation may be equally secured with safety by another method. That there is no new technic to be mastered is urged as an advantage and even more, that it simplifies the present method of extraction with capsulotomy by making this step in the operation the easiest of all.

Having expressed the objections from the technical, surgical, and mechanical point of view to the intracapsular operation and how these should be the determining or deterrent factors for the occasional operator, he says, "I am prepared to admit, if all goes well nothing could be more beautiful or productive of such brilliant results, but that qualifying 'if' looms large to one who has witnessed many extractions in the capsule." Then is taken up in detail the objections to the capsulotomy operation and is shown how under improved technic these are in large part no longer tenable, and how the difficulties associated with this method may be overcome.

Following this phase of the subject he goes into the matter of extraction of the clear lens in high myopia, the technic for Morganian cataract, for mature cataract, and for such lenses as present much clear cortex. In these every step is elaborated and reasons given for the choice of methods.

A perfect operation is not the claim of the essayist and he sets forth the difficulties, dangers, and objections to his own method. Told in the fewest words this operation comprises: an ample crucial capsulotomy made with a special knife entered through the cornea, the pupil having been widely dilated, six hours before the extraction proper, which is then performed in the usual manner. It is the writer's contention that during the waiting period the aqueous insinuates itself between cortex and capsule and leaves the lens so loosely adherent that it is released at the lightest touch. Statistics are given of the results obtained by operators other than himself and which show a high percentage of successes. In his closing sentences he says, "The method is safe and goes far to solve the problem of the immature cataract. It involves no departure from time-tried methods, nor is there a new and difficult technic to be mastered. It specially makes operable cataract in any stage of opacification and assures a clean and easy delivery of the lens."

DISCUSSION: DR. W. E. LAMBERT: Dr. Smith has said, his method of dealing with the immature cataract is in itself not new. I have frequently used it in connection with immature cataracts, where an extraction seemed advisable, and have even more extensively used it in the surgical treatment of high myopia.

I have found it a perfectly safe method, experiencing unpleasant complications in only three cases, all myopic cases, in two of which the complication was glaucoma which the extraction of the lens immediately relieved and the result was entirely satisfactory. The third complication was one not mentioned by Dr. Smith, the swelling of the lens and an extraction indicated, but the smear was found to be dirty and an operation would have been disastrous. Fortunately, the glaucoma was controlled by myotics and in a few days the smear was negative and the operation satisfactorily performed with perfect result.

I do not, by any means, advocate this method for general use, but only in such cases as it is indicated.

DR. H. H. TYSON: This subject is one which interests every ophthalmologist, both on account of the frequency with which he sees this condition and also his desire to adopt the procedure promising the best visual results with the greatest safety to the future integrity of his patients' eyes. In discussing this subject one can best give the opinion formed as a result of his personal experience, and the deductions from his observations of the operations of his confreres.

As to the intracapsular operation, I think that the results obtained at the Knapp Memorial Eye Hospital by the operators using that method give a better average result than indicated in the paper. While theoretically the damage supposed to be induced by the mechanics of the operation, as Dr. Homer Smith described, may occur, we know that in practice it happens quite infrequently.

We all have had cases where the patient performed involuntarily an intracapsular extraction upon himself by compression of his eyeball, and that very little reaction followed and with resulting good vision. Recently I saw such a case which has retained good vision for over seventeen years.

As to Dr. Homer Smith's method, of course imitators do not always possess the technique and finesse of the originators, and that accounts for the excellent results obtained by Dr. Smith and for some of the disappointments of others who have tried his method. Some years ago, in a discussion before this section, a number of operators stated that they had just as much difficulty in removing the cortex after extraction with Dr. Smith's method as in those cases performed without the preliminary capsulotomy. While I have been fortunate in obtaining good results in the few cases I have operated with the Homer Smith method, I also have had cases where the cortex appeared tenacious and resistant and failed to cloud rapidly after free crucial incision, and was difficult to evacuate completely. In my first case the lens was subluxated through faulty technique, as described by Dr. Smith, but a good result was obtained notwithstanding.

In the cataracts of feebleminded children, I have found a tendency toward the resistant tenacious variety, and would consider it as due to a biochemical condition of the individual. In considering any modification of the simple or combined method of extraction, has any been devised that gives better results than those obtained by the late Dr. Herman Knapp with an experience of thousands of cases? I think not!

While an operator should select the method applicable for each individual case, each has a preference for the majority of his cases, and mine is the combined extraction. While considerable depends upon the operator, just as much depends upon the patient and his condition. Heretofore little attention has been given to the patient's general condition previous to operation, and with the result in some cases that we have seen eyes lost which I am positive could have been preserved if the constitutional dyscrasia, sepsis, etc., had been treated and corrected previous to operation. I cannot urge too strongly the preparation of our cases for operation just as carefully and thoroughly as if for a major operation upon any other part of the body; then with asepsis and as little unnecessary trauma as possible during the operation, a favorable result may be anticipated with any of the approved methods of operating.

Dr. H. W. Wooton has only done two operations by this method. If Dr. Smith means that all cataracts which show slight binocular changes should be extracted immediately he does not agree with him.

If the cataract is nuclear and the patient over 60 years the lens can be extracted by the ordinary method, without soft lens matter remaining. If the cataract is cortical it is better to wait until the lens is mature unless you are afraid some other man will operate on your patient.

He does not believe that this method should be used generally.

Dr. Fridenberg said all operations have their vogue and the technic mentioned in the operation has been used for many years. He objects to doing the preliminary capsulotomy for the following reasons: We do not believe in multiplying operative proceedings; in preliminary iridectomy it is different for you can watch your patient until it is time to operate again. In this proceeding you must not operate too soon again to note reaction to your operation. He does not believe in making the incision through the clear cornea. It is better to operate sub-conjunctivally. He does not believe in hot bathing and taking tension after an intraocular operation. In the method by the use of the Kalt forceps a little traction may be used and if the zonule does not rupture easily proceed immediately to capsulotomy.

MEETING OF APRIL 18, 1921. DR. L. W. CRIGLER, CHAIRMAN.

Dr. Lee M. Francis of Buffalo, N. Y., read a paper on the **Surgical Treatment of Primary Epithelioma of the Cornea** (appears on page 331 of this issue).

Discussion: Dr. Arnold Knapp believed Dr. Francis's method was excellent, as it was founded on sound surgical principles. There is, however, a group of corneal carcinomata, namely, the flat variety, often covering the greater part of the cornea, which offer difficulties to complete surgical removal, and in whom radium has given remarkable results. He asked if Dr. Francis used the actual cautery in his operation.

Dr. Charles H. May said there was a peculiar interest attached to the treatment of one of the patients he had seen with epithelioma of the cornea. In this instance the growth was extensive, flat, covered fully two thirds of the cornea and it would have been very difficult to remove by excision. Radium was tried but twelve exposures proved ineffectual. The patient disappeared but returned a year later apparently cured: the epithelioma had been treated with applications of pure carbolic acid by Dr. H. H. Beers and the growth had been removed leaving a less opaque cornea than had been observed previously.

Dr. Douglas Quick said he had treated three or four patients with primary epithelioma of the cornea. Two features make them favorable for treatment by radium; lesions are usually recognized early and the cornea stands radium very well. If radium is applied accurately, it is of value. The first case was treated six times by filtered radium. The lesions cleared up and remained so. The case was first treated in 1917. The second patient was treated this past summer. One dose apparently cured the patient. Recently an arrangement has been made to use unfiltered radium held in a bell and applied to the cocainized eye. One hundred and sixty-two millicuries were applied for two minutes over the center and one minute over each extremity. One dose almost cured this lesion. In another case, 177 millicuries were applied for one minute—the lesion cleared up. Improvement in technique and more accurate dosage has greatly improved and facilitated the results in the more recent cases.

Dr. E. S. Sherman said he wished to emphasize what the essayist had said concerning the resistance of the cornea to penetration by this type of growth. The practical importance of this fact is that it is not necessary, in excising the growth, to go very deep in the cornea. His attention was first called to this several years ago by a case of epithelioma of the cornea of a man 60 years of age, which began at the nasal margin of the cornea and at first resembled a small pterygium. On account of symptoms of irritation it was excised. It soon returned in the form of a small superficial ulcerated nodule and slowly increased in size until after 2 or 3 years it was 4 x 6 millimeters. It was then excised with a Graefe knife; the cut surface was lightly touched with a galvano-cautery and covered with a conjunctival flap. This was early in 1917 and there has been no return of the growth.

Because the superficial character of these growths was not fully appreciated, the excision was carried deeper than necessary with the result that a few days after the operation there was a slight perforation of cornea. The distortion of the cornea from the excision caused 4 diopters of astigmatism. Doctor Sherman said that, while most of the growths of this character could be successfully treated by excision, in view of recent favorable experience that he had had with radium in epithelioma of the cornea, he would try that first.

Dr. Francis said, in closing, that he had not used the galvano-cautery in his cases. He saw no reason why carbolic acid should not be useful. He had also perforated the cornea in one of his cases, but the leak was not serious, nor did it impair the results.

Dr. E. C. Ellett, of Memphis, Tenn., read a paper on **The Corneal Suture in Cataract Extraction** (appears on page 341 of this issue).

Discussion: Dr. J. W. Cassell said he thought anything which adds to the safety of a cataract operation is worth while considering. He has used a modified Kalt suture in seventy-five cases and only had one prolapse of the iris. He believes it is valuable in that it allows one to get his patients up early.

Dr. E. S. Thomson said he did not believe a small amount of soft lens matter was very important except in delayed healing. He believes more in a conjunctival flap than he does in the suture. He does not use the corneal suture in the ordinary cases, but in dislocated lens cases he employs it. He thinks prompt healing in cataract extraction is very important. If vitreous is lost he believes that a suture is very convenient.

Dr. Lee M. Francis has operated upon fifty patients since he has seen Kalt's work. He believes the proper needle, needle holder, and thread are important factors. One of the most important disadvantages in his experience was the increased difficulty in making the incision because of cutting to a mark made by the sutures. Iris prolapse is not always prevented as evidenced in one case which developed vomiting, in which the suture tore out. He believes it is a valuable addition to the technique of the cataract extraction, especially in the hands of a master like M. Kalt and an expert operator like Dr. Ellett. The technique, however, is not easy and should be undertaken only after experience on animals' eyes.

Dr. E. C. ELLETT in closing said that he finds that sometimes the suture can be passed without grasping the conjunctiva with fixation forceps but merely steadying the eye with a little pressure against it with the closed forceps. The discussion emphasizes the fact that it is difficult to standardize any operation.

Dr. Karl Lindner, of Vienna, read a paper on **New Truths Regarding the Bacteriology of the Conjunctiva.**

DR. LINDNER gave a résumé of the results of his investigations on the bacteriology of the conjunctiva. In studying the trachoma question, which has been his special work for many years, it was of course necessary to make a careful examination of the epithelial cells. In these studies there were brought to light so many interesting new facts that he determined to look more closely into the behavior of germs in general with regard to the conjunctival epithelial cells. He found that all germs causing infectious inflammations of the conjunctiva, attack directly the epithelial cells. For this reason he identified infectious inflammation of the conjunctiva as "epitheliosis." Here germs are parasites of the epithelial cells and are fastened to the epithelial layers. The number of bacteria present in the secretion, at least in the beginning of the disease, is very small when compared with the great number found growing on and in the epithelial layers.

Dr. Lindner explained how an infection begins, how it advances, and how it is cured by nature, without intervention. He illustrated these findings by exhibiting a great number of microphotograms, demonstrating the action of all bacteria causing inflammation of conjunctiva.

First, the infecting germ or germs localize at a place on the normal epithelial layer, which is closed. There they multiply forming regular pavements adhering to the surface of the epithelial layer. From this point the bacteria spread over ocular conjunctiva as a result of the normal movements of the eyelids, forming at other points new foci of infection. From the first groups of germs toxins are produced which enter into the tissue by diffusion. This produces all the evidences of inflammation, such as enlargement of blood vessels, outgoing of blood serum and white blood cells. Inflammatory œdema is produced not only of the subepithelial tissue, but also of the epithelial layers. Thereby the connection between the epithelial cells becomes loosened. Furthermore the toxins produce a proliferation of the epithelial cells, which with the help of the œdema opens the layer which before this was closed and allows the germs to grow into the epithelial sheaths. The germs, however, remain fastened to the epithelial cells, where they continue to multiply. Considerable desquamation of epithelial cells goes along with the disease.

In infectious conjunctivitis the bacteria do not go into the subepithelial tissue, but confine themselves to the epithelium. The gonococcus, which is an exception, does that only rarely.

Other germs, such as Koch-Weeks, influenza-bacilli, and pneumococci, do not go deeply into the epithelial sheaths. This is especially true of the influenza-bacilli and pneumococci, which remain quite superficial. Dr. Lindner found also that all the germs referred to show a strong predilection for the bulbar conjunctiva, at least at the beginning of the disease.

The speaker then demonstrated the characteristic behavior of the various kinds of bacteria.

Diphtheria differs from all others in that the affected cells show marked signs of degeneration. Aside from this the diphtheria germ behaves as a typical epithelial parasite.

Trachoma may be classified with the bacterial infections, so far as the topography of the inclusions and free initial bodies are concerned, in fresh acute cases, because in this regard they are similar, in topography, to the infectious bacteria.

Following this, Dr. Lindner spoke about the natural process of healing, which he believed to be most clearly shown in gonorrheal conjunctivitis. Here the germs grow abundantly during the first few days, like large pavements, down to the subepithelial tissues, there being apparently nothing to stop this growth. At about the beginning of the second week, the germs are not to be seen in so great a number, nor do they extend any longer into the deeper layers of the now renewed epithelial layers. Careful examination shows often that quite a number of the more deeply situated gonococci are inside of the epithelial cells, having been phagocytated by them. In the third week, the thickened epithelial layer is, as a rule, practically free of germs, except that a few small pavements are seen on the closed surface of the conjunctival epithelium. No bacteria, however, are to be found in the deeper layers. It is seen from this that the epithelial cells fight against the bacteria, pushing these back to the surface until they disappear altogether from the eye.

The phagocytosis by the polynuclear leukocytes plays no material part in the cure, because this phagocytosis takes place only in the secretion and practically never within the epithelial layer.

In Koch-Weeks conjunctivitis the phagocytosis by the epithelial cells begins early, the germs disappearing usually, except for a few, after four or five days have elapsed. In pneumococcal conjunctivitis the germs remain quite superficial always and disappear usually from the fifth to the seventh day.

Diplobacillar conjunctivitis is a typical and well-known conjunctivitis, but cannot be classified with the conjunctival inflammations before mentioned. The bacteria causing this are not parasites of the normal epithelium of the conjunctiva. In this disease, pavements are not found on the epithelium, except where the conjunctiva changes into skin. In other words, they are found only on the transitional epithelial cells and the moistened epidermal cells where the diplobacillus grows in great number forming typical pavements. Here we have the focus of the disease known as angular conjunctivitis.

The usual saprophytes of the conjunctiva, xerosis, staphylococci, and pneumococci (streptococci) do not grow on the normal epithelial cells. They are, however, to a greater or less degree, to be found in the secretion, and on dead epithelial cells, hence referred to as saprophytes. Xerosis, the typical saprophyte of the conjunctiva, is found most commonly on the wrinkled dead epithelial cells, forming these regular pavements. Staphylococci are found in the conjunctival sac only in very small numbers and rarely as pavement only on transitional cells. Pneumococci may form a pavement on dead pavement cells of the bulbar conjunctiva, and under this condition they are saprophytes.

Many other bacteria described as the probable cause of conjunctivitis are not to be found in the epithelial layer, nor on the epithelial cells, but only in the secretion and often only by cultures. The topography of bacteria is to be seen clinically. That is, the part of the conjunctiva having most germs is not inflamed. In gonorrheal disease, for instance, the bulbar conjunctiva is most affected in the early stages. In Koch-Weeks conjunctivitis and pneumococcal conjunctivitis the germs grow in greatest numbers on the epithelial layer of the bulbar conjunctiva, and in this way we account for the fact that this part of the conjunctiva is especially affected. In diplobacillar conjunctivitis the bacteria grow on the angle of lids, and accordingly we refer to this as angular conjunctivitis. From all this we must conclude that it is quite impossible for any germ to be the cause of a typical conjunctivitis when these germs are not to be found on and in the epithelial layer of the conjunctiva but only in the secretion.

Dr. Lindner invited attention to the peculiar fact that in the later stages of all infectious conjunctivitis even in quite untreated cases the number of germs is comparatively very small and appears to bear no relation to the continuation of the disease. For example, in gonorrheal conjunctivitis, in the later stage, germs are few; in Koch-Weeks conjunctivitis, after four or five days, germs are usually difficult to find but despite this the untreated disease may last from three to four weeks.

Dr. Lindner's explanation was to the effect, first, that the epithelial cells appear to be becoming immune against the attack of germs, otherwise the disease would not be cured without intervention, and the general organism takes no part in the disease and its healing; second, the immunity is not acquired at once and passes probably through a state of hypersensibility, which might explain the duration of the inflammation despite the small number of germs in the later stages of the disease.

DISCUSSION: DR. WILLIAM MEHL, of Buffalo, N. Y. I am convinced that Doctor Lindner's discoveries in the matter of conjunctival infections are of the greatest practical value to us all.

To my mind there are two points which stand out with special force, and each of these points leads to important and practical deductions.

First: The doctor has demonstrated that saphrophytes of the conjunctiva thrive on dead epithelial cells which may happen to adhere to the normal layer, and that they are also found in the secretion of the eye, while on the other hand parasitic bacteria of the conjunctiva thrive on living conjunctival epithelial cells. By way of illustration he showed that the staphylococcus is a saphrophyte of the conjunctiva and not a parasite of that structure, and yet we all know that this germ causes intraocular infection. Since we have now been informed that the staphylococcus as well as various other germs are saphrophytes or benign germs of the conjunctiva, giving no warning of their presence, and that they may become parasites or malignant germs when they get into the interior of the eye, it is evident that we must make sure in every case that the bulbar and tarsal conjunctiva are cleansed thoroughly by mechanical means before we begin to operate. By this precaution we prevent, to a large extent, these germs from gaining entrance into the interior of eye during operation, and reduce danger from infection.

Second: The other point which has impressed me particularly has to do with the treatment of conjunctival infections· Until now the treatment considered most efficacious has been a local application of silver nitrate directly to the tarsal conjunctiva and cul-de-sac. Since we now know that the bacteria causing conjunctivitis are to be found not only on the tarsal conjunctiva and cul-de-sac, but also on the bulbar conjunctiva, it would seem that our method of treatment of these cases may be improved to a considerable extent. At any rate, we have been impressed with the need of according to the bulbar conjunctiva the same treatment as that given to the tarsal conjunctiva.

Dr. Martin Cohen asked Dr. Lindner if in his experience the microörganisms in mixed infection had been studied in reference to their localization on or in the conjunctiva; and whether smears from the tarsal conjunctiva were not sufficient.

Dr. Arnold Knapp asked how he obtained a smear of the epithelial cells?

Dr. Lindner in closing the discussion said that cell inclusion conjunctivitis is the only one of the purulent conjunctivitides which may be transferred to monkeys. Smears are made by cocainizing the conjunctiva and then scraping the epithelium away with the platinum spatula. Scrape only once. If you scrape twice you get blood which spoils the preparation.

DISCUSSION ON "DIABETES IN RELATION TO DISEASES OF THE EYE," AT THE ANNUAL MEETING OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM, 1920.

By Mr. P. G. DOYNE, London, England.

Sir Archibald Garrod, K. C. M. G.: To the physician the ocular troubles of diabetes are less obvious than to the ophthalmic surgeon, and this is especially true of hospital cases with diabetes who seldom make any complaint of their sight. This is in part due to the fact that the majority of hospital patients are young and suffering the more acute forms of the disease whereas the ocular lesions are most common in elderly patients. To the physician the ocular manifestations are rather matters of scientific interest than of practical value, whereas to the ophthalmic surgeon the recognition that symptoms are of a diabetic origin is of the utmost importance. Various estimates may be found of the frequency of ocular lesions in diabetes, but to be of any value they should be based on observations extending over a great many years.

Diabetic retinitis is of special interest. Here is a condition which presents an ophthalmoscopic picture sufficiently similar to that of albuminuric retinitis as to need an expert to differentiate. Diabetic retinitis is seen only in the elderly whereas albuminuric retinitis is met with at every age. In many cases of diabetes with retinitis and no albumin in the urine, post-mortem examination revealed morbid changes in the kidney. Again albuminuria in diabetes does not of necessity point to serious renal trouble, and patients with granular kidney may show no albumin in a 24 hours' specimen of the urine. These observations all tend to show that the occurrence of retinitis in diabetes is not necessarily to be attributed to the accumulation of sugar in the blood nor of the accompanying acetone bodies. More probably cardiovascular changes are an important factor and it will be found that diabetic retinitis is associated with increase of blood pressure. Speaking from his own records Garrod in most cases found evidences of renal disease in patients who developed diabetic retinitis. Probably hyperglycæmia, the most prominent feature in diabetes, is not even the most important factor in the production of retinitis. If it was so, retinitis would be seen in young diabetics. It is significant that cardiovascular changes and high blood pressure are present in nephritis cases, young and old, but are present only in diabetics over middle age.

Diabetes is no single disease but merely denotes the excretion of sugar in the urine over long periods. In some cases with continuous glycosuria the blood sugar is not in excess and may even be diminished, and there are cases of diabetes innocens where large amounts of sugar are excreted apparently without detriment and uninfluenced by diet. For the most part these occur in young subjects.

There is the acute diabetic of early life who dies in a few months and the mild diabetic of middle age who lives on for years and in whom sugar appears in the urine only after carbohydrate indiscretions. These latter cases, however, most frequently show the retinitis. There is the class of diabetics in which disease of the pancreas is responsible for the glycosuria and the cases where the origin of the disease is in the endocrine glands. It seems reasonable to adopt as a working hypothesis the idea that the vascular changes and the high blood pressure are the leading factors in the production of both diabetic and albuminuric retinitis but that a second metabolic factor is necessary for the production of the retinitis—in the one instance the accumulation of sugar in the blood and in the other the retention of urinary excretory products.

Regarding prognosis, diabetic retinitis has not so grave a significance as albuminuric retinitis.

After mentioning, as complications of the disease, the tendency to sepsis, iritis, lipæmia retinalis, lowered tension, retrobulbar neuritis, and the loss of the power of accommodation, Garrod, referring to cataract, states that the view that the withdrawal of water from the lens by reason of the presence of sugar in the aqueous humor, is no longer tenable as the amount of sugar present is insufficient and sugar itself has been shown to be present in the lens itself. The cataract, developing rapidly in young persons, must be the direct outcome of the disordered metabolism.

Regarding treatment, the great value of fasting is now amply proved. The method used at St. Bartholomew's Hospital is as follows:—2–3 vegetable-egg days are given, followed by 1–2 fasting days, then again 1–2 vegetable-egg days and so on. A rising scale of diet is then ordered until the limit of the patient's carbohydrate tolerance is reached. The treatment is repeated at intervals. The alimentary rest restores the tolerance to carbohydrates and gets rid of the hyperglycæmia and acetonæmia.

MR. FOSTER MOORE: The most important ocular manifestations of diabetes are:

1. Retinitis.
2. Cataract.
3. Retrobulbar neuritis.
4. Retinal and vitreous hemorrhages.
5. Lipæmia retinitis.

and of lesser importance:

6. Alterations in the ocular tension.
7. Alterations in the refraction.
8. Iritis.
9. Debility of accommodation.

1. Retinitis. While admitting the strong likeness between diabetic, renal, and arteriosclerotic retinitis, the following are the distinctive features of the diabetic form: (a) The patches of retinal exudate tend to have sharp-cut edges, are often solid and soapy looking, are frequently distributed in an uneven manner or tend to form an irregular ring wide of the macula. (b) The star-shaped figure is seldom seen. (c) The soft edged cotton wool patches, common in renal cases, do not develop. (d) Retinal hemorrhages tend to be in the deeper layers and so are roughly circular in outline and are usually well wide of the central regions. (e) Circular retinal pigment spots, seen in the late stages of renal retinitis, are not seen.

In addition diabetic retinitis does not occur in the young.

Judging from experience at a general hospital, the retinitis occurs in about 10 per cent of the cases of retinitis. The prognosis is less grave than in the retinitis of renal or arteriosclerotic cases.

Cataract. Foster Moore thinks that the term "diabetic cataract" should be confined to the rapidly developing opacity of the lens which occurs in young diabetics. This opacity is bilateral, of a diffuse homogeneous type and tends to start in the posterior layers. In older patients it is not possible to dissociate the senile element, though it would appear that the frequency of cataract in elderly persons (diabetics) is greater than in normal persons of the same age. As regards operation in these cases of elderly diabetics, though the healing after lens extraction is not quite so smooth or free from complications yet the majority of cases do well.

Retrobulbar Neuritis. This condition is probably not rare during the course of the disease and occurs usually in the middle aged cases. The onset is sudden and recovery is the rule, though if prolonged some permanent atrophy may result. Its development does not indicate an increase in the gravity of the prognosis. It is often difficult to dissociate the complication of tobacco and alcohol, the toxins of which superimposed upon the already sensitive nerve may be the real causative agent.

Lipæmia Retinalis. It is probable that only in diabetes does the condition attain a sufficiently high degree to give rise to the characteristic appearance. It is stated that the fat content of the blood must reach about 5 per cent before lipæmia retinalis occurs. In one case, seen by the speaker, the first sign was a milky appearance of the vessels, their color remaining unaltered. Slowly the milkiness became more pronounced and the color became more cherry red, the arteries and veins gradually approximated each other in color until the appearance was characteristic. It is seldom seen in any but young subjects and is of very bad prognostic purport.

Alterations in Refraction. This has been frequently noticed. The alteration is usually an increase towards myopia and alterations have been as much as 7D. A rapid return to the normal occurs with decrease in the sugar output.

Iritis. The clinical evidences of iritis are seldom seen; this is somewhat remarkable as histological examination of the eyes of diabetics almost always shows swelling and proliferation of the pigment epithelium of the iris. In one case seen by the speaker an acute primary iritis developed in a diabetic patient and no other discoverable cause was present. A gelatinous exudate rapidly formed in the A. C. similar to an acute gonorrheal iritis.

Dr. Leyton pointed out that the presence of sugar in the urine, though the simplest way of recognizing the disease, yet was one of the least important alterations in the metabolism. In diabetes mellitus the excretion of metabolites was impaired. By the use of phenolsulphonphthalein, a material easily recognized in the urine and excreted by most people at a uniform rate, he had found that the excretory powers of the kidneys in diabetes mellitus were impaired.

Regarding blood pressure and the vascular changes resulting from it, he pointed that different areas of the body were affected in different ways and this would account for possible changes in the retinal vessels with a general systemic blood pressure unaltered. He emphasized the ease with which other toxic stimuli—vaccines, tobacco, etc.,—would have a deleterious effect on the metabolism of a diabetic.

Dr. G. Mackay said that the rapidly developing cataract in young diabetics was the most common ocular phenomenon. It was usually diffuse and bilateral. He did not usually experience any greater difficulty in the surgical treatment of cataract occurring in diabetics, but one must bear in mind in these cases that their immunity to infection is generally lowered. He places retinitis as the second most frequent phenomenon.

Dr. F. J. Poynton said that from the examination of statistics he was forced to the conclusion that there was no such thing as a diabetic cataract but only cataract in the diabetic, the result of a presenile change; but in his opinion cataract was more common in diabetics than in sufferers from renal disease or cancer, in both of which conditions one would associate presenile change. Regarding ocular paralyses he would mention three cases; one, a recurrent paralyses of the 6th nerve, coinciding with an exacerbation of the glycosuria; the second, of abrupt onset, occurring to a cricket referee while actually on duty; the third, an ophthalmoplegia associated with severe bulbar symptoms.

Mr. P. H. Adams said in his experience diabetic retinitis was more common in females than males. In his statistics all the cases occurred between the ages of 50 and 70, and after the discovery of the retinitis 8 years was the longest period of life. He often saw patients with typical diabetic retinitis who were sugar free but who were found to have been treated for glycosuria, with success, some years previously. He mentioned a case of diabetic retinitis with lowered tolerance to tobacco. With reference to the lens changes, the appearance of numerous vacuoles is of the greatest significance.

Dr. Cammidge: He had reviewed the statistics of 350 of his cases and found that the age incidence of the various complications agreed with those of the previous speakers. Glycosuria is not a disease. It might occur in a variety of conditions. There was the condition in which sugar was present in the urine of young people persisting often indefinitely and little affected by diet. These people went on for years perfectly well. In them the blood sugar was below the normal. In the cases of diabetes in which there was a hyperglycæmia, there was the pancreatic type and the hepatic type and other types. The chemistry of these cases was not identical. For instance in the pancreatic type the blood did not easily coagulate whereas in the hepatic type it did. This might have a bearing upon hemorrhages in the retina. The question of the relative amounts of tyrosin and cholesterin found in certain forms of cataract was of interest. In the hepatic type there was an increased formation of amino acids, of which tyrosin was one. It was probable that diabetic cataract was partly dependent upon changes in the amino acid content of the blood. The changes in vision, occurring in people after they had got rid of their sugar, might be due to changes in the water content of the tissues of the eye. He had noticed many cases of diabetes develop œdema of feet and abdomen as the sugar and acidosis decreased.

Mr. Gray Clegg reviewed the cases of extraction of cataract in patients with glycosuria at the Manchester Royal Eye Hospital during the last 20 years. The final results were not remarkably below the average for all cataract extractions. A noticeable complication was the frequency of hemorrhage into the A. C. and hyphæma.

Dr. Hawthorne from his experience of cases of glycosuria said that retinitis was only an occasional event when glycosuria was abundant and it may occur with merely slight glycosuria. It seemed doubtful whether the glycosuria was responsible for it. With regard to the ocular palsies associated with glycosuria, the same might be said.

Mr. R. R. James recorded the results of 5 cases of cataract in young diabetics operated upon at St. George's Hospital during the last 11 years. In 4 of the cases the results were satisfactory and in one case the eye had to be excised. He advised preliminary medical treatment until a marked fall in the sugar output had taken place and then extraction without iridectomy. He did not advise lavage.

Mr. Bardsley mentioned two cases of diabetic retinitis in youngish persons, the age of one being 26 and the other 35. In both cases the retinitis had improved marvelously under a mixed Allen-Graham treatment. He did not think that it was possible by means of the ophthalmoscope to differentiate between albuminuric and diabetic retinitis. He objected to classifying those cases of retinitis without albuminuria or glycosuria as arteriosclerotic cases; the arteriosclerotic case formed a group by itself. Many of these cases of retinitis were due to varying toxæmias. In his opinion glycosuric retinitis was not necessarily accompanied by high blood pressure.

The case, aged 25, which he had mentioned, had a blood pressure of 120 and there was a large quantity of sugar in the urine and intense acetonuria. He had never seen a diabetic retinitis without acetonuria.

Mr. Stack spoke of the danger of coma occurring in diabetic patients on admittance to hospital. It was probably due to the change in the surroundings and diet. He thought it a wise precaution to make the change in the diet gradually.

Mr. Harrison Butler mentioned a special type of a diabetic retinitis of which he had seen two cases lately. It consisted in a dark area of pigmentation around the macula. He was strongly in favor of operating on cases of cataract in young diabetics. The gain to the patient, even with regard to the short period of life remaining, should be afforded him.

Mr. Burdon Cooper said that he had found on examining cataractous lenses removed from diabetic patients who also had sugar in the urine, that cholestorin was present in excess of the amino acid tyrosin. He had so far not tested the lens for glycogen. He thought that the dehydration theory of cataract should now be discarded; the pendulum was swinging the other way towards hydrolysis as the cause. He had estimated the sugar in the aqueous in one case of diabetes and found it to be 0.45 per cent; he did not think that that amount of sugar in the aqueous, of itself, could produce cataract. His own work confirmed the view that the acids and ferments which were secreted by the ciliary body into the aqueous were responsible for the hydrolytic changes in the lens. He mentioned an interesting case in his own practice of a child with lamellar cataracts upon whose lens 4 needlings produced no opacity. He concluded that in this case the aqueous was devoid of an hydrolytic ferment. He therefore fed the patient on root vegetables and in a few weeks was able to needle the lens satisfactorily. He regarded cataract as a decomposition taking place in the lens and regarded the term "senile cataract" as a misnomer as senility per se had little or nothing to do with the change.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. H. DICKINSON, London, England.

The Sections of Neurology and Ophthalmology held a two-evening debate on the subject of **ocular palsies** on the 10th and 11th of March, the chair on Thursday being occupied by Professor Reynolds, and on Friday by Dr. James Taylor.

Discussion on Ocular Palsies.

Dr. Gordon Holmes, who opened the debate, devoted a good deal of attention to the question of the situation and nature of the lesion in various forms of paralysis or paresis of oculomotor nerves, and he had much to say about associated palsies. A matter of much interest was the "unwillingness" or reluctance of some patients with cerebellar disease to turn the eyes towards the side of the lesion in performing conjugate deviation. Since he had been attached to the staff of Moorfields Eye Hospital he had seen many cases of ocular palsy, and in each of them he was conscious of a difficulty in deciding what the case was likely to be due to. Only by a careful weighing of the signs of associated disease could even a presumptive diagnosis be arrived at. With regard to such palsies occurring in association with Graves' disease, it was interesting and surprising that not very many years ago Hughlings Jackson and others regarded such palsies in this connection as very exceptional. Dr. Holmes, however, now saw a considerable number of cases in which the association existed. One had to regret, however, a paucity of histological work in this relation. With regard to so-called rheumatic or toxic neuritis of oculomotor nerves, he had seen a number of these cases, and there was a frequent involvement of the external rectus, or of the muscles innervated by the third nerve, associated with pain in the forehead on the same side; sometimes there was considerable anæsthesia. In some of the cases he had seen there was a septic focus in the neighborhood. In these cases Déjerine and others had found merely degenerative changes in some part of the nerve. He did not find it easy to conceive of cold affecting ocular nerves in their intracranial course. He did not feel that these cases were rheumatic, nor purely toxic, because most toxic affections were bilateral, or at least more or less symmetrical; whereas most of these palsies were unilateral. In the spinal cord, local collections of cerebrospinal fluid formed and compressed the roots of the nerves, or the cord itself, and he thought loculated collections of cerebrospinal fluid might form in the base of the brain and involve one of the oculomotor nerves.

MR. LESLIE PATON spoke of the complexity of the subject. For example, one disease alone—syphilis—was capable of producing an oculomotor paralysis in many different ways. It might affect any part of the oculomotor apparatus: cortical, supranuclear, nuclear, nerve roots, nerve trunks in their intracranial course, in the cavernous sinus, or in the orbit; or it might implicate the muscles themselves. A gumma might develop at any point. A syphilitic meningitis might affect the nerves. Syphilis, setting up disease of vessels, might cause hemorrhages affecting the nuclei or nerve roots. Or a syphilitic arteritis in the internal carotid might press on nerve trunks in the wall of the cavernous sinus, or an endarteritis might affect the vessels supplying the crura, the mid-brain, or the pons, and cause areas of softening. Or syphilis might cause general paralysis or tabes and hence the variety of ocular disturbances found in them. Yet probably not more than 40% of cases of ophthalmoplegia were due to syphilis.

Oculomotor paralyses might be divided into three main groups, of which there were subgroups.

I. Paralyses of central or cerebral origin, comprising: (a) supranuclear lesions; (b) internuclear lesions; (c) nuclear and nerve root lesions.

II. Paralyses of extracerebral origin, *i.e.*, of nerve trunks, again comprising, as subgroups, (a) intracranial; (b) intraorbital.

III. Paralyses of muscular origin.

The arrangement and relations of the oculomotor nuclei was, he said, the subject of much discussion, and no dogmatic opinion was possible at the present stage of knowledge. The important internucleal set of fibers was, undoubtedly, the posterior longitudinal bundle, for it was by means of this that the various oculomotor nuclei were brought into connection with one another and with the vestibular and auditory functions, and with the general muscular, the sense and the other afferent impulses in the body.

The connections of the posterior longitudinal bundle are, he said, intricate, and had not been yet completely worked out. The most important nucleus of origin of these fibers lay in Dieter's nucleus. The control of the internal musculature of the eye was also a matter of considerable doubt and dispute. The vascular supply of the oculomotor nuclei was derived from the anterior end of the basilar artery. The vascular lesions affecting the pons, crura, and this region gave rise to various interesting forms of crossed hemiplegia, the most important being known as "Weber's syndrome," "Benedict's syndrome," "Foville's syndrome," and the "Millard-Gubler syndrome."

Nuclear ophthalmoplegias, or ophthalmoplegias proper, could be subdivided into acute and chronic types. The acute included the toxic form caused by alcohol, Wernicke's acute polioencephalitis superior hemorrhagica being a good example. Good examples of the infective type were found in lethargic encephalitis, influenza, and syphilis. In a very definite proportion of cases of acute ophthalmoplegia, however, no infective agent can be traced. Of chronic progressive ophthalmoplegia, the most important form was that occurring in tabes and general paralysis of the insane. There were, besides, certain ophthalmoplegias of congenital origin, and others were of a distinct familial type.

Dr. Wilfred Harris thought cases of chronic nervous disease in which weakness of one internal rectus was noted on attempts at conjugate deviation, were not rare. He had seen a number. One was in the subject of disseminated sclerosis, who could not look upwards, though other eye movements were intact; he had no nystagmus. Such cases were probably due to interruption of the fibers of the posterior longitudinal bundle. He spoke of cases of damage to the 6th nerve following injection of the Gasserian ganglion with alcohol. The patient was a difficult subject, in whom three attempts had to be made, and then suddenly a greater quantity of alcohol than was intended entered the locality. Recovery from the result of this accident always occurred in a few months. He asked whether his colleagues recognized a rheumatic neuritis of oculomotor nerves, branches of the 3d or the 6th in the orbit. It had not been rare for him to see palsy in the external rectus with some pain in the orbit, and there might be some anæsthesia. He did not think the teeth were at fault in all the cases, nor was a definite septic focus evident.

Dr. J. Gray Clegg (Manchester) devoted attention to the occurrence of ophthalmoplegia in Graves' disease. Osler and McCree regarded such occurrence in this disease as a complication, rather than as part of the main disease, but in his *Pathology of the Eye* Parsons said extrinsic ocular paralyses in this association were not uncommon. J. S. Bristowe had recorded a case in which ophthalmoplegia externa followed Graves' disease after an interval of three years, and in that case no disease of the nervous system was found post mortem. This and similar cases Hughlings Jackson regarded as remarkable. According to G. F. Suker (*Journal of the American Medical Association*, 1917) a new ocular muscle symptom was present in quite a number of cases of Graves' disease, which that observer designated as a deficient complementary fixation in lateral rotation. It was considered by him to be due to the same underlying conditions as those which produced the other ocular muscle symptoms, *i.e.*, dissociation in the functions of the sympathetic and extra-ocular motor nerves of the eye. But it was rare for practically complete bilateral double ophthalmoplegia to occur in this association. Dr. Gray Clegg recorded in detail one such case in this contribution. Considerable recovery of ocular muscle power took place during the patient's convalescence from the general disease.

Dr. S. A. Kinnear Wilson limited his remarks to the question of the possible occurrence of unilateral cranial polyneuritis. He related the case of a man who had been in Palestine and Egypt, and in Cairo was very ill with pneumonia and pleurisy, and seemed to have a generalized pneumococcal infection. While his illness was at its height he developed complete paralysis of the 7th, 8th, 9th, 10th, 11th, and 12th cranial nerves, but only on the right side. Ordinary tests for nervous disease and syphilis tests proved negative. He had a girl under care who certainly had a rheumatic diathesis, and she had paralysis of the 5th, 6th, and 7th nerves on one side only. A case was on record of an Italian engine driver who always stood on the right side of his engine, and had the wind and rain on that side of his face; he developed paralysis of the 3d, 4th, 5th, 6th, 8th, and 12th on the right side only.

Mr. N. Bishop Harman commented on the comparative rarity of cases such as were under discussion. He said that in a consecutive series of 5,000 patients he had found only 27 instances of ocular palsy. Males were more often affected than were females (males 17, females 10). Paresis due to injury headed the list of causes, with 7; syphilis caused 5, and general vascular disease or degeneration 5. Two cases due to exposure were arguable; but in one of them there were very definite manifestations of inflammation over the affected muscle, and both cases were rapidly cured. His cases did not warrant the view that life was shortened by the occurrence of these paralyses. With regard to treatment, he said he knew of no more satisfactory way of overcoming the diplopia than the wearing of spectacles of which one lens was of ground glass. And of local measures of treatment, blistering, massage, and faradism were effective when the lesion was peripheral.

Mr. Hines read a joint paper by himself and Mr. MacMullen on **chronic progressive ophthalmoplegia externa.** They said that in their text-book on *Neurology of the Eye* Wilbrand and Saenger grouped as a clinical entity certain cases of external ophthalmoplegia which they considered to have certain definite characteristics which separated them off from the congenital cases, as well as from those due to a definite toxic cause, or to syphilis, or associated with some manifestations of widespread disease of the nervous system. These cases Wilbrand and Saenger stated to have the following characteristics: 1. Onset gradual, usually in infancy or early life.

2. The ophthalmoplegia is bilateral and very slowly progressive. 3. There are no other signs of disorder of the nervous system, nor any affection of the general health. 4. The disease may come to a standstill, either permanently or for long periods, at any stage in its development, but generally ends in complete, or nearly complete external ophthalmoplegia. Mr. MacMullen and Mr. Hinds showed to the Section two patients whose condition tallied with this description, and they had seen a third.

Mr. M. S. Mayou sent a short communication on two cases of paresis of the upward and downward movements of the eyes. A man aged 46, while straining at stool, was seized with severe pain in the head, and giddiness. Afterwards he could scarcely walk owing to the diplopia and inability to look in a downward direction. The pupils were active to light. Convergence and lateral movements were normal. The vision was $\frac{6}{12}$ in each eye, there was no optic neuritis, and the knee jerks were present. Wassermann reaction was negative. After rest, and the administration of iodide of potassium, the patient obtained full movement in the downward direction, but there remained some limitation of the movement of the eyes upward, and the attempt brought on a coarse nystagmus. Recovery was now practically complete. The second case was also a male, and his age was 42. He was suddenly seized with intense vertigo and diplopia, but no headache. The pupils were very sluggish; vision $\frac{6}{6}$ in either eye. Outward and inward movements were free, but all power of convergence was abolished. Knee jerks were present, Wassermann test negative. He was put on iodide of potassium, and gradually recovered. The sudden onset suggested hemorrhage as a cause. Mr. Mayou said that the position of the lesion had been variously stated to be the optic thalamus, the corpora quadrigemina, the pons, and some thought it was subcortical. None of those conjectures had been verified by post-mortem examination.

Mr. J. H. Fisher, referring to the cases in which the 6th nerve was accidentally damaged when injecting alcohol into the Gasserian ganglion, said he thought the damage did not occur actually in the floor of the cavernous sinus, but that the alcohol had stripped up the dura mater and involved the 6th nerve behind the sinus.

Dr. James Taylor expressed regret that myasthenia gravis had not loomed fairly large in the debate, as that was one of the common grounds on which the neurologist and the ophthalmologist met. Since he had been associated with Moorfields Eye Hospital he had seen many such cases, and he had been impressed by the great variability in their course, though in many the progress was definitely downwards. On one day the patient would have almost complete command of ocular movements, and at another time he could scarcely carry out any ocular movements, nor effectively use his arm and hand muscles. He described one remarkable case which was in an advanced condition, in which the patient suddenly developed an intense desire to return to his home—some 80 miles distant—where he went, and was not heard of again until he wrote asking for a certificate that he had been a sufferer from myasthenia, as he had been warned for military service! He was at the time following his occupation of carpenter.

Dr. Gordon Holmes and Mr. Paton replied.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by Drs. A. N. Alling, New Haven; M. J. Schoenberg, New York; T. H. Butler, London; P. J. Doyne, London; and K. Wessely (*Archiv für Augenheilkunde*), Wurzburg.

Edited by Matthias Lanckton Foster, M. D., F. A. C. S.,
New Rochelle, N. Y.

(*Continued from May number.*)

VII.—THE LIDS AND LACRIMAL ORGANS.

59. Bedell, A. J. **Multiple vaccination of the lids.** *American Jour. of Ophthalmology*, February, 1920.

60. Gallemaerts. **Palpebral fistual of the accessory lacrimal gland.** *Annales d'oculistique*, clvi., 3.

61. Howard, C. N. **Carcinoma of the orbit originating in the lacrimal gland.** *American Journal of Ophthalmology*, May, 1920.

62. Kubik. **Cysts of the lacrimal sac.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., p. 264.

63. Nagel, C. S. **Fungus concretion in the lacrimal canaliculus (streptothricosis, actinomycosis).** *American Journal of Ophthalmology*, May, 1920.

64. Paterson, J. V. and Fraser, J. S. **Intranasal dacryocystostomy.** *British Journal of Ophthalmology*, May, 1919.

65. Schiller. **Sarcoma of the eyelid.** *Zeitschr. f. Augenheilk.*, lii., p. 302.

66. von Szily. **Pathology of the lacrimal passage in the roentgenogram.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., p. 31.

67. Weis. **New operation on the lacrimal sac from the nose.** *Med. Klinik*, xvi., p. 138.

68. Wells, D. W. **An infected granuloma of the lacrimal gland.** *American Journal of Ophthalmology*, August, 1919.

69. Wheeler, J. H. **Free dermic grafts for the correction of cicatricial ectropion.** *Ibid.*, April, 1920.

Bedell (59, **Multiple vaccination of the eyelids**) reports the case of a woman who had dressed a vaccination wound and developed three days later a severe ulceration of the right lower lid, which spread to the cornea and went on to perforation. An extensive symblepharon resulted which necessitated a transplantation operation. There was also a less marked ulceration of the left lower lid. ALLING.

SCHILLER (65, **Sarcoma of the eyelid**) describes a case of melanosarcoma of the conjunctiva of the lower lid. A black elevation with a slightly granular surface ran from the middle of the margin of the lower lid to the lower transition fold. Microscopical examination showed: The conjunctival epithelium was normal, broken only in one place by fine, fibrillary connective tissue with few nuclei. Beneath the epithelium were irregular masses of lymphoid cells forming confused strings. The connective tissue was very sparse in the middle of the tumor, abundant in the periphery in thick cords. Much dark brown pigment was demonstrable in the tumor partly as granules in the tumor cells, partly free in masses, especially in the connective tissue. Schiller gives a review of the published cases of sarcoma of the lid, from which he finds that both sexes are affected about equally often. Leucosarcoma appears at all periods of life, the pigmented form after the third decade. The frequent involvement of the lower lid is noteworthy. Both forms usually originate in the conjunctiva tarsi and in the transition fold. Comparatively often sarcomata start in pigmented nævi, and follow traumatism. Pigmentation of the conjunctiva is often seen in the neighborhood of the neoplasm. The prognosis as to recurrence is unfavorable, particularly in children. The interval before recurrence is quite uncertain. The tumors very rarely penetrate the globe, but frequently involve the orbit. Treatment is thorough, early removal.

WHEELER (69, **Free dermic grafts for the correction of cicatricial ectropion**) does not approve of pedicle flaps in these cases but prefers a free flap from the lid or temple. After opening a wound in the lid and cutting out all cicatricial tissue he denudes three small areas at the edge of each lid and sutures them together so that they adhere thus keeping the wound apart. A flap is then sutured into the wound and firm pressure applied. If the ectropion is of the lower lid and a graft taken from the upper, the results are most gratifying.

ALLING.

NAGEL (63, **Fungus concretion in the lacrimal canaliculus**) operated upon a tumor about the size of a small bean situated over the lower canaliculus and found a dark green mass which was removed in toto. It proved to be a case of streptothrix.
ALLING.

According to PATERSON and FRASER (64, **Intranasal dacryocystostomy**) it seems probable that some modification of West's operation will become stereotyped as the classical treatment of those cases of dacryocystitis which do not yield to a course of lavage. Treatment by probing was condemned by Percival Pott and is now universally discredited as unsurgical and disappointing in its effect. Probably every ophthalmic surgeon has seen eyes lost from a serpent ulcer of the cornea caused by infection from a dacryocystitis "cured" by probing. Paterson, an ophthalmic surgeon, and Fraser, a rhinologist, both of Edinburgh, have operated upon a series of cases by a modification of West's operation which they fully describe with the help of some useful diagrams. Of 50 cases operated upon, 48 reported, 24 in person, 24 by letter. Of the former 19 were completely cured, 2 had slight epiphora, and 3 were failures. Of the latter 19 wrote that they were cured, 1 stated that she had slight watering of the eye, and 3 were as bad as they were before the intervention.

The reviewer for the past two years has referred most of his cases to a competent rhinologist who has performed a West's operation. The results have not been tabulated but have been most gratifying. The important factor in the case is to choose a rhinologist who will take an interest in the work and master the necessary technique. Every ophthalmic hospital should number a rhinologist upon its staff. So far in England the only hospital that has taken this step is the Birmingham Eye Hospital which has recently appointed Mr. F. W. Sydenham as Honorary Rhinologist. T. HARRISON BUTLER.

WEIS (67, **New operation on the lacrimal sac**) has modified West's operation somewhat. Under local anæsthesia he incises the nasal mucous membrane, shoves back the periosteum from the outer side of the frontal process of the superior maxilla, chisels out a bony flap about ½*cm* broad, and removes this with the mucous membrane. He then removes the greater part of the lacrimal sac with sharp forceps under the guidance of a finger placed on the outer surface. He says that the operation gives a good result.

KUBIK (62, **Cysts of the lacrimal sac**) describes a case met with in a woman 21 years old, who had epiphora, but whose lacrimal sac readily washed through. In the region of the lacrimal sac there was an elastic swelling which extended upward to the palpebral ligament, downward into the lacrimonasal duct where its limits could not be made out. No regurgitation on pressure. Toti's operation was performed, and the swelling was found to be caused by a cyst filled with serous fluid which did not connect with the lacrimal sac, but was attached to its posterior wall.

VON SZILY (66, **Pathology of the lacrimal passage in the roentgenogram**) reports two cases in which the only apparent fault in the lacrimal sac was a secretion of pus. As syringing of the sac met with no obstacle, there appeared to be no stenosis and no change in the canal. But the X-rays showed in both cases a fistula between the lacrimal sac and the nose which could be recognized in no other way. Such a fistula may be caused by an empyema or tuberculosis of the ethmoid cells, or by a primary disease of the lacrimal sac, and, under certain circumstances, it might bring about a spontaneous healing of a dacryocystitis.

GALLEMAERTS (60, **Palpebral fistula of the accessory lacrimal gland**) describes a case of this nature.

HOWARD (61, **Carcinoma originating in the lacrimal gland**) removed a small tumor of the lacrimal gland but it recurred in four months. He then did an exenteration of the orbit cauterizing the entire orbit. After four years there was no return of the growth.

ALLING.

WELLS (68, **An infected granuloma of the lacrimal gland**) removed a tumor of the lacrimal gland, the major part of which consisted of a fibrous stroma supporting collections of irregular branching tubular glands and of tissue made up of fibrous elements, vessels, and large numbers of lymphocytes. There were also collections of so-called epithelioid cells. Although the Wassermann test was negative and also the skin test for tuberculosis the diagnosis seemed to lie between syphilis and tuberculosis. ALLING.

VIII.—THE ORBITS AND ACCESSORY SINUSES.

70. Blair, V. P. **Report of two cases of Kroenlein's operation.** *American Journal of Ophthalmology*, November, 1920.

71. Blake, E. M. **Orbital, epidural and brain abscess. Autopsy and microscopic studies.** *Ibid.*, December, 1920.

72. Charlin, Carlos. **Orbito-cranial syphilis.** *Annales d'oculistique*, clvi., 4.

73. Dimitry, T. J. **An operation relegating enucleation of the eye to its proper position.** *American Journal of Ophthalmology*, September, 1919.

74. Oertel, T. E. **Spontaneous luxation of the eyeball.** *Ibid.*, November, 1920.

75. Stenger. **Relations of eye diseases to diseases of the nose and accessory sinuses.** *Med. Klinik*, xvi., p. 221.

76. Van Duyse and Aubineau. **Epithelioma of the orbit.** *Archives d'ophtalmologie*, xxxvi., 7.

Blair's (70, **Kroenlein's operation**) first case was a tumor of *2cm* across which was attached to the posterior surface of the globe and extended backward into the orbit. It was composed of fibular tissue and of cells resembling glio cells as well as of fibroblasts. It was vascular and contained nerve fibers. The other case was one in which the blade of a pocket knife had broken off in the orbit and had been retained for a number of years. At operation the blade was found in the orbit with the point extending into the middle fossa of the brain. It was easily removed and the patient made a good recovery.

Alling.

Blake (71, **Orbital, epidural, and brain abscess**) reports a case of infection of the orbit from a purulent frontal and ethmoid sinusitis. The patient died from purulent meningitis and brain abscess. Such cases show the importance of immediate drainage of the nasal sinuses in beginning orbital involvement.

Alling.

Oertel (74, **Spontaneous luxation of the eyeball**) relates the case of a negro woman, 25 years of age, whose left eye could be luxated between the lids by retracting them. At times the eye protruded through the lids spontaneously especially when stooping. The vision was normal and the ophthalmoscopic examination negative. Alling.

Charlin (72, **Orbito-cranial syphilis**) reports ten clinical observations, illustrating various and well-known clinical types of ocular disturbances produced by gummatous processes in the orbit, or in the periosteum adjoining the optic foramen, the orbital fissures, or in the meninges in their immediate vicinity. He classifies the symptoms according to the location of the pathological process under the following headings: (a) visual; (b) pupillary; (c) ophthalmoscopic; (d) motor; (e) sensitive; (f) vascular; (g) trophic; (h) change in position of eyeball; (i) inflammatory. Some of his cases were negative as to the history and serology and clinical examination but responded promptly to the antisyphilitic treatment. He insists upon a careful examination of the visual motor apparatus in all the cases with periorbital neuralgia, because some of them may have a periostitis in the superior orbital fissure causing pressure upon the first branch of the fifth nerve. In such cases, the presence of diplopia localizes the process.

SCHOENBERG.

DIMITRY (73, **Modification of Mules's operation**) advocates the following substitute for enucleation. He separates and dissects back the circumcorneal conjunctiva and them removes the anterior segment of the globe, cutting through the sclera about *2mm* back of the cornea. The contents of the eyeball are then scraped out and a circular window is cut about the optic nerve through which the nerve is severed and the disk removed with the stump of the nerve. A small glass or gold globe is inserted and the sclera stitched over it.

ALLING.

VAN DUYSE and AUBINEAU (76, **Epithelioma of the orbit**) have removed from the inner angle of the orbit of a patient 58 years of age, a fibro-mixoma. One year later the tumor recurred and operation revealed the presence of a myxo-epithelial tumor. Finally after another year another recurrence of the tumor appeared which, by examination, proved to be an epithelioma. SCHOENBERG.

STENGER (75, **Relations of eye diseases to diseases of the nose and accessory sinuses**) shows that acute and chronic forms of conjunctivitis may be caused by mechanical hindrance of nasal respiration through the disturbance induced in the ventilation of the accessory sinuses and the lymph circulation, and are often cured through intranasal treatment. He thinks that more attention should be paid to the nasal treatment in eczematous keratoconjunctivitis, for in addition to the above we have often to deal in these cases with adenoids and a marked secretion of mucus. Abscesses of the orbit are almost always caused by diseases of the accessory sinuses, particularly of the ethmoid, either through direct contact, or through the blood, lymphatic, or connective tissue connections. The clinical signs of orbital diseases are familiar to ophthalmologists. Surgical interventions for their relief are often inefficient. First of all it must be determined whether an acute or a chronic inflammation is present, for the treatment varies accordingly. The chronic form calls for an incision to relieve the orbital condition, and a simultaneous thorough cleaning out of the accessory sinuses, because they contain the true focus of disease. In the acute form it is important to restore the physiological outflow of the accessory sinuses, which may often be attained by such a simple means as cocainization of the nasal mucous membrane, in spite of the threatening symptoms. Sometimes resection of the inferior turbinate is necessary. Disease of the ethmoid cells plays a great part in the acute form. Pain upon pressure in the supraorbital region is no proof that a frontal sinusitis is present. Diseases of the lacrimal sac are often caused by intranasal conditions or infections, and remarkably good results may be obtained in many through endonasal treatment. In long existing dislocations of the eyeball one must take into consideration a possible neoplasm from the accessory sinuses, especially a mucocele. The differential diagnosis of this condition is frequently very difficult. Retrobulbar neuritis induced by accessory sinus disease demands rhinological treatment. The writer thinks it not impossible that cataract and glaucoma may be caused by stasis in the orbit induced by accessory sinus disease, for intranasal changes are to be found very frequently in patients with cataract. This is a field which needs more investigation by ophthalmologists and rhinologists. Finally reflex neuroses are excited in the eye by lesions in the nose and accessory sinuses, and are amenable to treatment by the rhinologist.

IX.—THE CONJUNCTIVA.

77. DENIG, R. **Early surgical treatment of burns of the conjunctiva** *American Journal of Ophthalmology*, April, 1920.

78. Derby, G. S. **The control of trachoma among the alien labor companies of the British and American expeditionary forces.** *Ibid.*, July, 1919.

79. Eaton, F. B. **Field investigation of the ætiology of trachoma in eastern Kentucky.** *Ibid.*, June, 1920.

80. Friedenwald, H. **Self-inflicted conjunctivitis.** *Ibid.*, December, 1920.

81. Gonzalez, J. de J. **Clinical notes on vernal catarrh and exuberant corneal conjunctivitis.** *Ibid.*, April, 1919.

82. Hiwatari, K. **Detaching the bulbar conjunctiva as a treatment of trachomatous pannus.** *Ibid.*, March, 1919.

83. Hiwatari, K. **Trachomatous changes of the caruncle.** *Ibid.*, April, 1919.

84. Howley, B. M. **The treatment of trachoma and chronic conjunctivitis with negative pressure.** *Ibid.*, March, 1919.

85. Kruse. **Necrotic phlyctænæ.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., p. 80.

86. Morton, H. M. **Hypertrophic subconjunctivitis.** *American Journal of Ophthalmology*, June, 1920.

87. Patterson, J. A. **Tubercle of the conjunctiva.** *Ibid.*, September, 1919.

88. Posey, W. C. **A case of pemphigus.** *Ibid.*, July, 1920.

89. Schnaudigel. **Conjunctiva neuro-allergica.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., p. 70.

90. Sculco, N. **The new treatment of trachoma.** *Clinique Ophtalmol.*, viii., 2.

91. Ticho. **Epibulbar congenital tumors.** *Arch. f. Augenheilk.*, lxxxv., p. 226.

92. Veasey, C. A. **Unusually large primary epithelioma of the ocular conjunctiva.** *American Journal of Ophthalmology*, February, 1920.

Derby (78, **Control of trachoma among the alien labor companies in the expeditionary forces**) had charge of trachoma among the alien labor companies and treated the problem after the manner of the British with whom he was associated during part of his service. The men were Chinese, Indo-Chinese, North African, and mixed nationalities. In all 12,461 were examined. Thirteen per cent had conjunctivitis; 2% trachoma. They were classified as infected, doubtful, and clean. It was not thought possible to segregate the infected cases, as the British did, but they were treated regularly and all companies were subjected to frequent examinations in order that the new cases which developed might be quickly discovered. A copy of the instructions issued to the officers of the labor bureau is appended. Alling.

Eaton's (79, **Ætiology of trachoma**) studies were conducted under the direction of the Public Health Service. His conclusions are that no new facts have substantially advanced our knowledge during the past few years. Climate, soil, dust, and individual predisposition are contributing causes only. There is no evidence that the trachoma virus has an ectogenous existence—the human conjunctiva is its sole habitat. By far the most potent cause of the disease is interhuman contagion due to insanitary habits. Alling.

Hiwatari (82, **Detaching the bulbar conjunctiva as a treatment of trachomatous pannus**) makes an incision through the fornix from the inner to the outer canthus. Sutures are then introduced into the lower lip of the wound and the conjunctiva is detached from the globe down to the corneal edge. The incision is then sutured. He has operated upon twenty cases with excellent results. Alling.

Hiwatari (83, **Trachomatous changes of the caruncle**) examined microscopically an enlarged caruncle taken from a trachomatous eye and found that it contained four lymph nodes lying close together. There were also Leber bodies which are always found in trachoma. He claims that his observation is the first to prove that follicular trachoma invades the caruncle. Alling.

Howley (84, **Treatment of trachoma and chronic conjunctivitis with negative pressure**) advocates negative pressure, of from three to seven pounds, applied by means of a glass tube. Scarification is often done before using the treatment. He claims that the procedure removes infective secretions and causes absorption of infiltrated tissue. He thinks that it is of service in cases which are too advanced for expression.

Alling.

Sculco (90, **The new treatment of trachoma**) extracts the active principle from a plant (*Nepeta citriodora*), which according to him has a specific action upon the infectious agent of trachoma. To this extract he adds resins and glucosides contained in *Thymus serpillium* and *Salvia officinalis*. The powder obtained is enclosed in small vials. Each vial contains one dose. The remedy acts mainly when trachoma is well developed, with corneal complications. The initial stage is very little affected by it. The treatment consists of applying one dose of powder on the tarsal conjunctiva. The eye is then covered with cotton and bandaged for about two hours. A burning sensation which follows the treatment subsides in about twenty minutes. The applications are made every day. On the third or fourth day the follicles have to be expressed with a Knapp roller forceps. Care must be taken to flush the conjunctival sac and the cornea with tepid water or salt solution to thoroughly remove particles of powder lodged in folds or on ulcerated surfaces, because these particles of powder may irritate the eye very intensely.

This remedy clears up only the trachomatous process and the corneal infiltrations; it has no effect upon a vernal catarrh or chronic conjunctivitis which may coexist.

SCHOENBERG.

GONZALEZ (81, **Clinical notes on vernal catarrh and exuberant corneal conjunctivitis**) has observed changes in refraction, usually myopic astigmatism, sometimes of high degree, accompanying this affection. He thinks that it is brought about by the fact that the pericorneal infiltration produces nutritive changes decreasing the resistance of the cornea to intraocular pressure and that the constant rubbing of the eyes, on account of the itching, tends to change the curve. He has found the X-ray beneficial. Exposures of eight minutes are made not oftener than once in three weeks.

ALLING.

MORTON (86, **Hypertrophic subconjunctivitis**) relates four cases which he considers rare. They are characterized by a more or less hardened mass involving the lower lid under the conjunctiva. The lesion is a chronic hyperplastic inflammation due to traumatism.

ALLING.

SCHNAUDIGEL (89, **Conjunctiva neuro-allergica**) includes under this term all forms of eye trouble known as chronic catarrh and dry catarrh, which have been called hysterical, are associated with photophobia and reduction of ability to do near work, last for years, and are not influenced by any form of treatment, although no essential lesion can be made out. He thinks that in the majority of cases these troubles are of tuberculous origin; that the toxines circulating in the blood render the sensory nerves of the eye allergic and hypersensitive.

Specific treatment frequently produces startling results, as shown by the clinical histories given. He has treated forty cases in the last ten years, of which thirty-six were cured by the injection of bacillus emulsion. The doses are small, the maximum 0.0001. He begins with an injection of 0.000001 and increases this dose at intervals of four or five days until the maximum is reached after three or four injections. The total number of injections is ten.

KRUSE (85, **Necrotic phlyctænæ**) reports a case in which a large phlyctæna broke down leaving a circular defect which reached deeply into the sclera. The cavity filled up gradually with cicatricial tissue, and a disk-shaped scar covered with conjunctiva long remained visible at this place.

DENIG (77, **Early surgical treatment of burns**) urges immediate operation if the burn of the conjunctiva is deep. The burned area is carefully removed and the defect covered by grafts of mucous membrane taken from the mouth. He claims that contractions and encroachment on the cornea are avoided by this method.

ALLING.

FRIEDENWALD (80, **Self-inflicted conjunctivitis**) relates two cases in one of which the conjunctiva was congested and swollen while in the other there were granulations resembling trachoma. He thinks that these conditions were produced by mechanical irritation at least, after all other treatment had been tried in vain, they recovered when the eyes were protected by a shield.

ALLING.

POSEY (88, **Case of pemphigus**) reports the case of a colored woman who suffered from a chronic skin disease which took the form of small blisters in different parts of the body. The dermatologists diagnosed it as dermatitis herpetiformis or Duhring's disease which is allied to pemphigus. The palpebral conjunctiva was injected and showed a series of irregular gray areas. There was marked shrinking of the conjunctiva with the lashes turned in against the globe. The conjunctivæ are still contracting and the corneæ are becoming hazy.

ALLING.

PATTERSON (87, **Tubercle of the conjunctiva**) reports the case of a boy who showed large masses of granulation-like tissue springing from the conjunctiva of the upper lid in which there was deep ulceration. The child has enlarged tonsils and adenoids and a swollen parotid gland. Tubercle bacilli were found in the smears. The growth disappeared under injections of tuberculin.

ALLING.

TICHO (91, **Epibulbar congenital tumors**) found an oval, pale red, vascular tumor, 8*mm* long by 4*mm* broad, lying across the upper corneoscleral margin in a woman 25 years old. One third of it lay on the sclera, two thirds on the cornea, reaching almost to the upper margin of the pupil. It had a smooth, glistening surface covered by conjunctiva, and had a cyst about 3*mm* in diameter in the scleral portion. Dermoid was excluded by the atypical situation, the smooth surface, the absence of depressions or hairs, the soft consistence, the yellowish color, and the fact that it was distinctly movable. The clinical diagnosis was that of congenital lipoma of the conjunctiva. The histological examination after removal showed it to be composed of a superficial horny, laminated epithelium, connective tissue, fat, many vessels, and a cyst lined with cylindrical epithelium; a congenital fibrolipoma of the conjunctiva. Whether the cyst was congenital or not, and whether the fibrolipoma was conjunctival or subconjunctival, were not determined.

VEASEY (92, **Unusually large primary epithelioma of the ocular conjunctiva**) relates the case of a man, 56 years old, who since a boy had had a small reddish mass on the temporal side of the sclera. It began to grow about three years previous to the examination and then was the size of an English walnut protruding through the lids. The mass and the eyeball were removed. There was no evidence of penetration of the eyeball but the sclera was infiltrated.

ALLING.

X.—THE CORNEA, SCLERA, AND ANTERIOR CHAMBER.

93. ASMUS. **Zinciontophoresis in ulcus serpens.** *Zeitsch. f. Augenheilk.*, xlii., p. 216.

94. BULSON, A. E. **Five cilia in the anterior chamber.** *American Journal of Ophthalmology*, February, 1920.

95. BYERS, W. G. M. **Reticular keratitis.** *Ibid.*, October, 1920.

96. FEINGOLD, M. **Granuloma of the cornea.** *Ibid.*, July, 1919.

97. Fox, J. W. **A new operation for the relief of conical cornea.** *Ibid.*, October, 1919.

98. Friedman, E. D. **Unilateral anæsthesia of the cornea and conjunctiva.** *Journal of the A. M. A.*, June 21, 1919.

99. Green, A. S. and Green, L. D. **An operation for keratoconus with report of two cases.** *American Journal of Ophthalmology*, June, 1920.

100. Guist. **Dystrophia epithelialis corneæ.** *Ophth. Ges. in Wien*, October 27, 1919.

101. Lauber. **Demonstration of a case of corneal plastic.** *Ges. d. Aerzte in Wien*, December 12, 1919.

102. Loewenstein. **Transfer experiments with the virus of febrile herpes.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., p. 15.

103. Maghy, C. **Observations of blood staining of the cornea.** *Amer. Journal of Ophthalmology*, September, 1919.

104. Matsuoka, Y. **Nature of the so-called blood infiltration of the cornea.** *Ibid.*, August, 1920.

105. Pringle, J. A. **Gas infection of the cornea.** *British Journal of Ophthalmology*, March, 1919.

106. Sidler-Huguenin. **Traumatic herpes corneæ.** *Korrespondenzbl. f. Schweizer Aerzte*, 1919, No. 17.

107. Spicer, Holmes. **On the formation of clear spaces in corneal nebulæ.** *British Journal of Ophthalmology*, January, 1919.

Iontophoresis with zinc failed in only one out of the twenty-one cases reported by Asmus (93, **Zinciontophoresis in ulcus serpens**), and that was a very bad case in which Saemisch's operation had to be performed. In all of the others the effect was almost immediate. Optochin was subsequently used in some of the cases, but in five in which it had been used previously it failed to bring the ulcers to a stand still until the iontophoresis had been employed.

Loewenstein (102, **Transfer experiments with the virus of febrile herpes**) finds the virus in the blebs of herpes febrilis easily transferable to the corneæ of rabbits, where it excites a disease similar to the human herpetic keratitis. Various control experiments with the blebs from burns, pemphigus, pustules of eczema, and the blebs of herpes zoster, proved negative. The virus did not lose its virulence when transferred from the cornea of one rabbit to that of another. Its infectious quality was still present in very weak dilutions. It loses its activity after being heated for half an hour in a water bath at a temperature of 56 degrees, and after having been kept in an incubator for twenty-four hours. It is not demonstrable in the blood of patients suffering from herpes. Its nature was not determined, except that it probably passes through the filter. The keratitis produced by the inoculation is an infiltration of the parenchyma with polynuclear leucocytes which breaks down. In the layer directly affected are to be found cystic degeneration of the epithelium, formation of blebs, breaking down of Bowman's membrane, and a mortification of the superficial layers of the parenchyma.

According to SIDLER-HUGUENIN (106, **Traumatic herpes corneæ**) herpes corneæ is in most cases due to a general febrile disease, but it is possible that it, together with fever, may occur after a traumatism. But in such cases it is not the trauma, but the fever which is the exciting factor.

All of the symptoms, the age of the patient, and the course of the disease in the case reported by GUIST (100, **Dystrophia epithelialis corneæ**) were the same as those in the cases hitherto described, with the exception that the margin between the opacity and the clear cornea was everywhere sharply defined.

FEINGOLD (96, **Granuloma of the cornea**) reports a case of burn with muriatic acid which developed a dense corneal opacity and two small tumors at the limbus. These gradually disappeared. A second case of burn with lime resulted in a granuloma of the cornea near the center and the eye was enucleated on account of glaucoma and pain. The mass showed the histological characteristics of a granuloma arising from the anterior layers of the cornea. The process of formation of these tumors seems to be that the healing of the wounds involving more or less loss of tissue is accompanied by the production of granulations. It is questioned whether some cases of supposed spindle-celled sarcoma may not have been simple granulomata. In the treatment too much manipulation should be avoided and abscission may not be advisable on account of the danger of opening an avenue of infection into the eye.

ALLING.

FOX (97, **New operation for conical cornea**) bisects the cornea with a Graefe knife making an incision in a plane parallel to the horizontal plane but above it. He then cuts a narrow strip from one edge of the wound and sutures with fine silk. He claims that little reaction takes place and the results are gratifying. ALLING.

GREEN (99, **Operation for keratoconus**) advocates a modification of the Lagrange operation in these cases on the theory that the intraocular pressure is too high for the eye although normal in measurement. He has operated upon three eyes with some improvement in vision.

ALLING.

BYERS (95, **Reticular keratitis**) reports a case of this condition which he discovered in both eyes of a man aged 47. He was able to determine that the lines were in or immediately beneath Bowman's membrane. The corneal epithelium was slightly raised as shown by distortion of the reflexes. There was no congestion of the eyes. The tension was 13*mm* and he concludes that the phenomenon is caused by buckling of Bowman's membrane and this in turn to diminished tension. Folding of Bowman's and Descemet's membranes is often observed in shrunken eyes.

ALLING.

MAGHY (103, **Blood staining of the cornea**) reports four cases showing this condition with pathological findings. One was the result of needling operations, two of perforating wounds, and one from burns from a gas attack in the war. Some dark refractile bodies staining with eosin were found and sometimes blood corpuscles. These pigment granules are transformed hemoglobin. Access to the cornea is gained through Descemet's membrane.

ALLING.

Two cases of traumatic vitreous hemorrhage throwing new light on this subject are reported by MATSUOKA (104, **Nature of the so-called blood infiltration of the cornea**). Both eyes showed spindle-shaped greenish granules in the vitreous and one of them the same bodies in the cornea. All these granules were proved by analysis to be of the same nature. He thinks that the peculiar infiltration produced from the red cells is not formed in loco but in some other place and, as such, carried to the cornea. He acknowledges, however, that there is a type of case in which the staining of the cornea is caused exclusively by freeing of the blood pigment.

ALLING.

LAUBER (101, **Demonstration of a case of corneal plastic**) showed a case in which an excellent result had been obtained from a plastic operation on the cornea. The patient was 29 years old. The vision was $\frac{6}{12}$, and with the proper glass the patient could read fine print. The cornea had been taken from an eye that had to be enucleated on account of chronic iridocyclitis.

Friedman (98, **Unilateral anæsthesia of the cornea and conjunctiva**) has found that the corneal reflex is absent in practically all cases of hemiplegia with or without coma and attributes it to anæsthesia of the cornea and conjunctiva. The anæsthesia may be due to the presence of sensory fibers in the motor tracts but more likely to remote effect on the sensory pathways. He thinks that the phenomenon is a valuable diagnostic point.

Alling.

Pringle (105, **Gas infection of the cornea**) describes cases of infection of the cornea with gas forming organisms the result of war injuries.

In one example which is illustrated bubbles of gas were seen in the layers of the true cornea. These increased in number and eventually one of them burst upon the surface. The eye was eviscerated and the man made a good recovery. The microörganisms present were: streptococci, staphylococci, bacillus perfringens, and bacillus sporogenes.

A striking feature of the cases, was the rapidity with which the cornea became infected. In each case it was only a matter of a few hours. It would appear that an actual break in the corneal epithelium is necessary before the gas organism can gain access to the substantia propria.

T. Harrison Butler.

Bulson (94, **Five cilia in the anterior chamber**) reports a case in which he found five cilia in the anterior chamber following a wound of the cornea. He removed them and there was no reaction following the operation.

Alling.

Holmes Spicer (107, **On the formation of clear spaces in corneal nebulæ**) has made a special study of the cornea and any communication from him upon this subject is worthy of more than ordinary attention. His presidential address to the Section of Ophthalmology of the Royal Society of Medicine delivered on November 6, 1918, is a model of careful observation and clear thinking. Many ophthalmic surgeons have examined the cornea for years and yet have failed to see what Spicer presents in twenty-two illuminating pencil drawings. A careful study of the Plate which accompanies the paper fills the mind with good resolutions to use the loupe with greater persistency and see the structures which Spicer describes. Good illumination and a good platyscopic lens were employed to examine the cornea. Probably a corneal microscope would be even better, but unfortunately few ophthalmic hospitals possess them and still fewer surgeons.

Spicer points out that the changes in the cornea that follow inflammation are often striking in appearance and interest. The presence of clear lines in old corneal scars has been described by very few observers although they have long been known and were seen even before the loupe came into general use. In 1893 in the *Beiträge zur Augenheilkunde,* Fuchs published a paper upon the subject, but the best and most recent account of these lines is by that excellent observer Sydney Stephenson (*Trans. Oph. Soc. U. K.*, vols. xxxiii. and xxxv.). Stephenson ascribes the lines to the resorption of blood vessels. As the changes are dependent upon the presence of blood vessels it is necessary to recapitulate the various types of blood vessels which are seen in the cornea. These vary mostly according to their depth in the corneal tissue. Surface vessels pass over the limbus from the conjunctiva and lie between the epithelium and Bowman's membrane. They divide and twist freely like the branches of an oak tree. The *arborescent form.* These occur in superficial keratitis, ulcers, or trachoma, and represent free branching uncontrolled by the pressure of surrounding tissues. In addition to this surface invasion by trunk vessels with their branches the terminal capillary loops of the limbus advance over the cornea in a series of arches. This *terminal loop* form is common in marginal inflammation, ulcers, and trachoma. It is also seen in acute interstitial keratitis in which vessels invade the cornea at almost all depths. The terminal loops persist on fine silky lines on the surface. The *brush* or *bosom* form of vessels arise from a trunk vessel running upon the surface of the sclerotic a few millimeters distant from the limbus, it dips into the sclerotic and reappears in the cornea. The branches resemble that of the birch rather than the oak. It is typically seen in interstitial keratitis. The *umbel form* occurs in localized inflammation of the deeper corneal layers. A single vessel invades the cornea and remains unbranched till its terminus where it divides into radial vessels like the head of a parsley flower. Generally in the cornea veins cannot be distinguished from arteries by the naked eye, but with the *loupe* each vein can be seen to be single and accompanied by one or two small arteries. The veins are larger and join without the intervention of capillaries, all these small vessels may be regarded as capillaries in which the distinction of artery and vein is retained till the final transition. It is uncommon for vessels to disappear and leave no trace, they generally remain as fine silky threads on the surface or deeper clear lines.

Vessels keep to their own level in the cornea, and do not generally anastomose with those of another layer. In severe cases of interstitial keratitis the corneal lamellæ are softened and anastomosis may occur.

The clear lines left by vessels are of two kinds, the geometrical group and what Spicer calls the mushroom cap or coral reef formation.

The geometrical lines lie in the midst of nebulæ of varying density. The lines are straight or run in long curves. They may be parallel, diverging or converging, or radiating from a center. The lines may cross each other. They can sometimes be traced to the limbus or may be confined to the center of the cornea. Spicer has little doubt that the lines have as their basis the tracks of old vessels. The tracks become straight because of the contraction of the scar tissue.

The second group resembles a mushroom in section. They are secondary to ulcerations which have become vascularized. They are also seen after attacks of scleritis in which the cornea has not taken part.

T. Harrison Butler.

(*To be continued*)

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ARCHIVES OF OPHTHALMOLOGY.

THE OPHTHALMOLOGICAL FINDINGS IN TRAUMATIC ASPHYXIA WITH THE REPORT OF A CASE.

By Dr. PAUL D. BERRISFORD, St. Paul, Minn.

(*With one illustration on Text-Plate XXIII.*)

THE appearance of pathological ocular phenomena as the result of traumatic injury received in other parts of the body is an extreme rarity. However, in traumatic asphyxia or traumatic apnœa as it is sometimes called, infrequent as is its occurrence, almost invariably presents externally an ophthalmological picture at once striking and characteristic.

Case Report.—Mr. H. A., age 47, while demonstrating a two-ton tunneling machine, became pinned under it through accident. Although eight minutes elapsed before his release he retained consciousness throughout. A little later he passed into a stuporous condition in which he remained for four hours.

Upon admission to the hospital the clinical appearance of the case was as follows: the entire face, neck and upper part of the chest was of a slate-blue color as well as the external surfaces of the upper limbs. Where the collar band and elastic sleeveholders exerted pressure upon the skin surface, the integument appeared normal in color and in sharp contrast to the adjacent pigmented field. There was marked distention of the veins of the neck and face together with a puffiness that particularly involved the eyelids. The eyes were proptosed, the bulbar conjunctivæ protruding between the palpebral fissures as the result of subconjunctival suggillations. Where the lids stood in contact with the bulbar conjunctiva, the latter exhibited congestion but without hemorrhage. The pupils were widely dilated and unresponsive to light. There were submucous petechiæ marking both sides of the nasal septum, the soft palate, and the tympanic membranes of the ears. There was also present a sublingual suggillation and a hemorrhage occupying the position of the frenulum epiglottidis. A fracture of the second, third, and fourth ribs of the left thorax was demonstrable.

An ophthalmoscopic examination made on the fourth day following the accident revealed the fact that in either eye there was a dilatation and increased tortuosity of the retinal veins together with a slight blurring of the disk margins, particularly the nasal halves. The left fundus showed two discrete, bluish-gray, elevated patches approximating the superior temporal quadrant of the disk. The right fundus contained similar spots scattered about in the retinal area between the optic nerve head and the macula but not involving the latter. Some distance from the disk an elevated exudative area ensheathed the inferior temporal vein. Despite the most searching examinations no retinal hemorrhages could be detected.

The earliest description of this condition was recorded by Olliver d'Angers in 1837 (cited by (1) Tardieu, (2) Wienecke, and (3) Milner), his observations being based upon a clinical examination of 23 persons who were crushed in a crowd at the Champ de Mars. Since that time there have been recorded innumerable cases of like nature resulting from panic through fire alarm *e.g.* Hospital du Bon-secour, Paris, 1848 (4) (Tardieu); Pon de la Concorde, Paris, 1866 (4) (Tardieu); Vienna Ring Theater, 1881 (5) (Burrell and Crandon); Victoria Hall, Sunderland, England, 1883 (6) (Waterson); Charity Bazaar, Paris, 1897.

The most striking clinical finding in traumatic asphyxia is the color of the face and neck and occasionally the upper part of the chest. This discoloration is described by various authors as bluish, bluish-gray, deep purple, etc., depending upon the degree of the injury and the duration of the cutaneous change. When examined minutely the skin is seen to be mottled with tiny areas of normal white color surrounded by a poorly defined bluish border, these borders uniting to form a mesh-work (5) (Burrell and Crandon). In view of the conclusions drawn from animal experimentation, anatomical research and histological study it can be assumed that the true cause for the cutaneous discoloration in this condition is a venous stasis brought about through over-distention of the veins and capillaries. The dilated capillaries contain deoxygenated blood without its extravasation excepting in mucous surfaces.

OPHTHALMOLOGICAL CONSIDERATIONS.

Particularly noteworthy are the ocular manifestations and visual phenomena that have been observed in traumatic asphyxia, *e.g.* subconjunctival hemorrhages, proptosis, intrinsic muscular derangements, vitreous, retinal and optic nerve changes, etc. Assuming that in this condition the discoloration of the skin is to be explained by intense venous engorgement with capillary stasis, are we to expect the ocular findings attributable to a like cause? A review of the venous circulation of the orbit is not out of place at this juncture.

The ophthalmic veins are two in number, relatively large in size, markedly flexuous in course and with their numerous branches form plexiform communications. The superior ophthalmic vein commences anteriorly with the nasofrontal vein and at the root of the nose anastomoses with the angular vein. In its course it receives the anterior and posterior ethmoidal veins, the muscular, vorticose and posterior ciliary veins and near its termination the central retinal vein although the latter may open directly into the cavernous sinus (7) (Sobotta-McMurrich). The course of the inferior ophthalmic vein is inconstant, arising from the veins of the lower lid and of the lacrimal sac and terminating in two branches; one passes through the spheno-maxillary fissure to the ptergoid plexus, the other joins the superior ophthalmic vein emptying with it into the cavernous sinus. Occasionally the inferior ophthalmic vein opens into the cavernous sinus independently. Although (8) Parsons contends that there is a complete absence of valves in the veins of the orbit (9) Rauber maintains that only the inferior ophthalmic vein is valve-containing and this venous channel is smaller and relatively less important as compared to the superior ophthalmic vein.

Thus it is that the cavernous sinus, the pterygoid plexus and the veins of the face are in intimate relationship with the orbital venous flow. In fact there is good reason to believe that in the stooping position the orbital venous flow is returned via the angular and facial veins whilst in the upright and the supine postures it escapes through the cavernous and pterygoid avenues. It is, therefore, reasonable to suppose that in traumatic asphyxia, there is, during the period of thoracic or abdominal compression, a tremendous and sustained venous engorgement of the veins of the orbit, bombarded, as it were, by the hydraulic pressure from the venous flow in the cavernous sinus, the pterygoid plexus and the angular and facial veins.

The appearance of proptosis in this condition, as in the reported case, must be explained by the occurrence of one or more of the following pathological entities, orbital congestion, œdema, or hemorrhage. That orbital venous stasis plays a rôle in its production has been referred to and an accompanying œdema of the cellular tissue may be supposed, for, reasoning by analogy, the puffiness of the skin of the face and eyelids in the reported case suggested subcutaneous serous extravasation together with venous engorgement. However, orbital hemorrhage more especially hemorrhage into the optic nerve sheaths cannot be positively excluded as a causative factor. Nevertheless, in orbital hemorrhage whether traumatic or non-traumatic in origin *e.g.* fracture of the skull, hemophilia, scurvy, increased blood-pressure due to coughing, sneezing, etc., the blood once liberated finds the path of least resistance and eventually appears under the conjunctiva and the skin of the lids. In traumatic asphyxia there has yet to be recorded a case exhibiting hemorrhage of the lids substantiated by histological examination.

In our case the appearance of hemorrhage beneath the bulbar conjunctiva, confined as it was to that portion of the globe which is exposed when the lids are agap is conclusive evidence that the blood did not originate from the retrobulbar tissue. The probable explanation for this phenomena rests upon the fact that at the moment of injury the conjunctival veins and capillaries are forcibly distended those within the field of the palpebral fissure suffering the greatest lacking as they do the counter pressure from the lids.

There remains to be considered the effect of orbital venous stasis upon the globe itself. It has been ascertained that increased intraocular pressure may arise either from increased arterial or venous pressure. "The latter probably occurs in specific cases, being caused either by increased general venous pressure or by a mechanical constriction of local vessels" (8) (Parsons). As (10) Adamuk, (11) Graser and (12) v. Schalten have shown, there is a slight but inconstant increase of intraocular pressure when the external and internal jugular veins are tied. Further, (10) Adamuk and (13) Leber working independently have shown that when the venæ verticosæ are ligated there is a marked rise of intraocular pressure. In the opinion of the author, the free anastomosis of the orbital veins and the thinness of their valve-free walls permits ready accommodation for the abnormal quantity of venous blood, which, in this condition they must receive; and with this thought in mind the likelihood of an increased intraocular pressure is slight.

The pupillary changes in traumatic asphyxia are found to be variable. In the reported case and in that recorded by (14) Morian and by (15) Braun the pupils were dilated and fixed, in (17) Lange's first case, slightly dilated but reacted to light and convergence. (5) Burrell and Crandon report a case in which the pupils were small and did not react to light while (16) Beach and Cobb and Lange (second case) noted the pupils equal and equally responsive to light and accommodation. As one might expect the appearance of these pupillary phenomena is transitory.

In Lange's first case the failure of the pupils to respond to light he explains as the consequence of an injury to the oculomotorius resulting from a venous congestion or an existing œdema of the retrobulbar tissue. That a pupillary paresis may obtain he refers to a partial paralysis of the oculomotor nerve which supplies the pupil.

Interesting is the fact that in traumatic asphyxia only the portion of the oculomotorius supplying the intrinsic ocular musculature is affected. An attempted accurate description of the site of the lesion and its underlying pathological foundation giving rise to the aforenamed pupillary disturbances is obviously futile when we consider our scanty knowledge concerning the retrobulbar and finer intracranial changes in this disease. However, in the opinion of the author the lesion does not lie within the orbit and for the following reasons: 1st the pupillary disturbances when present are bilateral and equal; 2d despite the frequently reported sign, proptosis attesting fairly extensive retrobulbar changes, only those derivatives of the oculomotorius supplying the ciliary muscle and the sphincter iridis are affected notwithstanding the close anatomical proximity of the other ocular nerves in the relatively confined orbital apex. The intrinsic muscular derangements, exclusive of those directly traceable to amaurosis resulting from optic nerve involvement, in the author's opinion may be postulated as eventuating from venous congestion or œdema implicating either the third nerve or dilator nuclei (18) (Starling) situated in close proximity beneath the aqueduct of Sylvius on the floor of the fourth ventricle, or an interference with their reciprocal innervation through affection of a portion of the sensorimotor area of the brain. The affection of the above named areas through hemorrhage and its resultant cerebral softening may be excluded as a possible pathological factor because of the transitory nature of the pupillary phenomena. (15) Von Braun, (19) von Recklinghausen, (3) Milner, (20) Ruppauner, (21) Schultze and (17) Lange have been unable to discover the smallest intracranial hemorrhage upon post-mortem examination.

Concerning intrabulbar lesions, their description and frequency, much is wanting for only occasionally has an ophthalmoscopic examination been made. In two cases reported by Beal (22) (Parker) the fundus picture was one simulating embolism of the central artery, that is, retinal œdema, thin arteries, dilated and tortuous veins and retinal hemorrhages. (5) Burrell and Crandon report a case in which small retinal hemorrhages were demonstrable. (2) Wienecke cites a case in which there were found two small hemorrhages peripherally situated, consequently leaving the central vision unimpaired.

(23) Rönne reports an interesting case. The second day following the injury the fundi were normal. On the following day the patient complained of haziness before the left eye with marked diminution of vision. Five days after the injury, although the ophthalmoscopic examination showed the retinal arteries and veins to be normal in appearance, there was a

complete amaurosis, a total abolition of pupillary activity. In the fellow eye there was a hemorrhage to be seen at the temporal edge of the papilla, a finding not to be observed on the two previous examinations. The amaurosis of the left eye remained complete.

Ramsey upon examining a case that came under the observation of (24) Sir George Beaton found that a double temporal atrophy of the disks existed with a loss of vision that later proved progressive. The visual fields were contracted.

In Moeser's case (22) (Parker) there was a partial atrophy of the optic nerve.

(17) Lange reports a case in which a slight swelling of the macular region obtained, œdema, without further evidence of retinal involvement.

However, to (25) Neck must be given the credit as the first to discover fundus changes in traumatic asphyxia. In the case recorded by him he noted small capillary hemorrhages in the macula and with them vitreous hemorrhage. After two months there was a transformation of the macular hemorrhages into a whitish area with a corresponding central scotoma and a vision reduced to four twelfths. The vitreous hemorrhage had become replaced by a web-like organized mass with attachment to the retina (retinitis proliferans).

Together with the pathological entities cited in the above cases certain subjective ocular phenomena may attend the condition. During the period of respiratory embarrassment if the patient retain consciousness, or as a precursor to the loss of consciousness the patient may experience complete visual obscuration: "I was unable to distinguish between light and dark"; "All became black around me," (the reported case); "All became black" (15) (Braun).

An attempted explanation for these varying ophthalmological changes must of necessity be speculative. In all probability they are but the expression of gradations of a distinct clinical entity traceable to a common cause. This may be referred to a retrobulbar hemorrhage exerting pressure upon the optic nerve and its contained blood vessels or an elevation of intraocular pressure through retardation or arrestment of the efferent lymph flow coursing through the canalis hyaloideus, the perivascular lymph sheaths of the central retinal vessels and the intravaginal lymph space. As the work of (26) Marckwort and (27) Ulrich has shown the arrestment of the efferent lymph flow through the above named channels has no effect upon intraocular pressure. This was demonstrated by tying a ligature about the optic nerve. In the opinion of the author, a hemorrhage into the optic nerve or vaginal space can produce any of the aforenamed ophthalmoscopical pictures and may be explained on an anatomical basis peculiar to the region.

In the intracanalicular portion of the optic nerve the sheaths are closely adherent to one another, the dura to the bone, the pia to the nerve. The vena centralis posterior (28) (Kuhnt) collects the blood from the orbital part and opens directly into the cavernous sinus (29) (Vossius). The distribution of the venous passages in the orbital part of the optic nerve and sheaths may be considered as consisting of four systems, coursing parallel to the axis of the optic nerve and which through anastomotic branches stand in anatomical association. They are (1) vena centralis anterior; (2) the veins of the pia; (3) the arachnoid; (4) and the dura. The vena centralis anterior at the optic nerve head usually sends branches which intercommunicate with the choroidal venous plexus and along the course to its exit gives off venous twigs which traverse the optic nerve septa. The vena centralis anterior usually opens directly into the cavernous sinus. Although the veins of the pial sheath collect blood from the optic nerve septa their chief tributaries are the intermediate branches from the dura which bridge the vaginal space. That the vena centralis posterior opens directly into the cavernous sinus and usually the vena centralis anterior as well, are facts which, to the writer, are of anatomical import in an attempted explanation for hemorrhages into the optic nerve and vaginal space in traumatic asphyxia.

In this condition there arises at the moment of injury an increased venous pressure within the veins encased by the skull. These valveless channels, confined as it were within a ridged box of fixed volume, do not permit of expansion. Consequently, to assume that considerable back-pressure may be transmitted to the blood column of the vena centralis posterior irom the cavernous sinus into which it empties is not illogical fn cognizance of the fact that the latter is uninfluenced by the counter-pressure maintained by the skull. Having in mind the fact that there exists a free anastomosis of the veins of the dural sheath with the widely distributed and readily distensible ophthalmic veins hemorrhage into the vaginal space from this source is hardly to be expected. The author, therefore, ventures the opinion that in traumatic asphyxia where hemorrhage into the optic nerve or vaginal space obtains its site of origin is either the vena centralis posterior, the vena centralis anterior or their ramifications. The detrimental effect resulting therefrom finds expression in a temporary inhibition of the function of the optic nerve or, in more severe cases, a permanent partial or total loss of vision through degeneration of the optic nerve fibers. Whether the diminution of vision be prolonged or permanent depends mainly upon the duration and degree of pressure exerted by the hematoma.

In the main, transient disturbances of vision are to be ascribed to another cause, an intraocular venous stasis implicating the retina and the choroid and of short duration. To repeat, the veins of the optic nerves and sheaths anastomose freely with the choroidal venous plexus. The external nuclear layer and the layer of rods and cones depend for their blood supply upon the choriocapillaris. With this in mind, it becomes manifest that a sudden rise of venous pressure within the veins of the optic nerve and sheaths will be transmitted to the choroidal venous plexus. The venous stasis within the choroidal venules thus produced, gives rise to transitory visual phenomena through œdematous affection of the rod and cone layer.

Before concluding the monograph there has yet to be considered a possible explanation for the temporary amaurosis and the ophthalmoscopic findings in the reported case. During the first forty-eight hours following the accident light perception was completely lost, gradually returning after that time until on the fifth day fingers could be counted at six feet. A visual test made six weeks later showed normal vision in either eye as well as normal fields for both form and color. That the lesion was one of hematoma involving the optic nerve or sheaths seems probable in view of the presence of dilated and tortuous retinal veins and a visual impairment out of all proportion to the ophthalmoscopic findings.

Of particular interest were the discrete, bluish-gray, elevated patches that marked the retinæ. At first glance they assumed the appearance of isolated medullated nerve fiber areas. Closer inspection proved them to be slightly elevated with discrete and rounded borders. Their superficial position was evinced by the fact that in the right eye an elevated spot ensheathed the inferior temporal vein. An ophthalmoscopic examination made eight weeks after the accident showed that a gradual absorption of these areas in the right eye was taking place while in the left eye there was no evidence of their former presence. An examination was again made nine months after the accident and there remained not the slightest trace of the pre-existing fundus changes. These bluish-gray patches were no doubt œdematous swellings involving chiefly the nerve fiber layer of the retina, a supposition emphasized by their superficial appearance and their ability to undergo complete absorption.

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BRIEF NOTES ON SOME OPHTHALMOLOGICAL CONDITIONS.[1]

By Col. HENRY SMITH, I.M.S., London, England.

CONGENITAL CATARACT AND MICROPHTHALMOS.

CONGENITAL cataract in my observation is generally hereditary; I have frequently seen a number of members of the same family suffering from it and have generally been able to get a history of heredity. Like malformations in general you are not safe in assuming that the patient has no other congenital weakness. It is frequently associated with microphthalmos. I have seen three such cases in one morning. Microphthalmos varies in the degree of dwarfness of the eye; marked cases have always got an inferior congenital coloboma. I have seen a case of congenital cataract which shortly after needling became the subject of frequently recurring petit mal, which no drugs would control. We are thus not always safe in giving a favorable prognosis in such cases. With regard to the removal of cataract in adult subjects of microphthalmos you are very liable to assume that the lens is small in proportion to the size of the cornea. I advise you to beware of this temptation. In fact they are generally large and out of proportion to the size of the cornea.

We must operate on these cases for cataract and by this means can generally improve vision, though seldom do we get vision anything up to the degree that we are able to get in normal eyes. If the lens is soft we should needle or extract by capsulotomy.

In microphthalmic cases which have reached middle life, it is as easy to extract in capsule as in any other case provided the incision is large enough.

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[1] Presented before Section on Ophthalmology, New York Academy of Medicine, May, 1921.

DRAWN-UP PUPIL FOLLOWING CATARACT OPERATIONS.

The issue I wish to put before you in this connection is that whenever you make your incision for iridectomy you *always* make your iridectomy up to or beyond that incision. I have never been able to do otherwise. When the cornea is clear we do not want an iridectomy up to an interior sclerocorneal incision; such is unsightly and not so good for visual purposes as a more central pupil.

What I do as the result of experience in such cases is to make my incision in the cornea just where I want the lower edge of the pupil to be. Through this wound I seize the edge of the drawn-up pupil, draw it out, and snip off a small piece. If we make the incision in the cornea oblique, the scar will be big in proportion to the obliquity of the incision. We should make it at right angles to the surface of the cornea, in which case the scar will be linear and so small that it is only noticeable to the trained observer. In any case it is at the lower edge of the pupil and is thus out of the line of vision. It is astonishing how central we can make an artificial pupil in this way. I am not aware that this procedure has been put forward before.

CONTROL OF THE EYELIDS IN CATARACT OPERATIONS.

A great deal of our trouble in cataract operations is due to the pressure which contractions of the orbicularis put on the eyeball. In the simple operation for cataract, prolapse of iris is, in my opinion, due to pressure from this cause, not only immediately after the operation but for six or seven days after operation. To complete an operation with the speculum in situ is to give the patient an extra point d'appui for the application of such pressure. I have long advocated that the assistant should draw down the lower lid by the application of the surface of his thumb to the face close to it and with the third, fourth, and fifth fingers of his other hand to press back the brow while with the thumb and index finger of the same hand he lifts forward at right angles to the vertical line of the head the upper eyelid on a large strabismus hook. This applies to the actual extraction of the lens and the subsequent toilet. While making the incision the upper eyelid can be drawn back with any retractor—it can also be done with a speculum, if the assistant holds back the eyebrow and the operator is careful. By the first means above outlined we can almost always control the patient's power of applying pressure. The management of the upper lid as here indicated may be found difficult. It is simplified by a separate assistant taking charge of the brow. The control of the brow is a very essential part of this procedure; the anatomy of the orbicularis muscle itself indicates to you this fact.

I want some of the younger members of the profession to find a drug, which when injected into the neighborhood of the orbit will paralyze the orbicularis muscle, for a period of six or seven days and which will do this with certainty. Such would enormously facilitate cataract operation and would in my opinion practically render it no longer necessary to do an iridectomy in cataract extraction. I have tried novocain for this purpose. Its action is only of short duration. I found it so erratic and uncertain that it was useless. Quinine urea hydrochloride I tried in the strength of one in six hundred after reading Crile's anocei association. It was useless. I gradually increased its strength to 6 in 100, at which strength with this irritant I was inducing œdema of the area, but did not succeed in getting any paralysis. It was merely an irritant and had none of the paralyzing power claimed for it by Crile. I tried to strike the ophthalmic division of the 7th nerve where it crosses the lower jaw with a hypodermic needle using novocain. I had done a number of dissections on the postmortem so as to be perfectly familiar with its locality. Out of many attempts I only succeeded once (estimating success by results). The result in that case was ideal for the short time it lasted. By such failures we learn what we cannot do. We want some means of accomplishing these ends with uniformity, with certainity, and with ease.

We know that any irritant injected into the trunk of a motor nerve will paralyze it. We know that the duration of the paralysis depends on the strength of the irritant. Quinine urea hydrochloride is such an irritant, rectified spirit is another.

We know that pure rectified spirit injected thus will paralyze a motor nerve for months.

I would like some of the younger members of the profession to expose the sciatic nerve of guinea pigs or rabbits and to inject it with varying percentages of rectified spirit and find out what strength would paralyze it for a period of seven days. I think it would be found that from 5 to 10% would be sufficient.

If we then novocainize the area where the ophthalmic division of the 7th nerve crosses the lower jaw and cut down on it and inject it with this solution and stitch up we would accomplish an object. To do so would not be painful to the patient nor would the scar be unsightly. To find the nerve when we cut down might not be just so easy; a pole of a very weak battery would assist us in finding it. I am quite prepared to hear a howl at this suggestion, but if it came off and were as satisfactory as I anticipate the howl would cease.

REPORT OF A SECOND HUNDRED SUCCESSIVE EXTRACTIONS OF CATARACT IN THE CAPSULE AFTER PRELIMINARY SUBLUXATION WITH THE CAPSULE FORCEPS.

By Dr. ARNOLD KNAPP, New York.

THE technique in this series has not changed from that described in my previous article (these ARCHIVES, vol. xliv., 1915). The incision is scleral with a conjunctival flap. After iridectomy the Kalt forceps is applied as low down as possible at the lower pupillary margin, the blades are opened wide under the iris and a large knuckle of capsule is grasped carefully, firm enough to hold and not too tight lest the capsule be torn. After a varying degree of manipulation, the cataract in its capsule, if subluxated, is seen to press forward the iris below and its lower margin appears and remains in the pupillary space below; the forceps are then released. The incision is then enlarged with the scissors if a large enough opening to permit easy egress of the lens in its capsule is not assured. The technique is then that suggested by Col. Smith in his "tumbling" maneuver. The cataract finally is extracted, adherent at its upper extremity where the suspensory ligament still holds. With the concavity of the Smith hook under the cataract drawing upward, this final adhesion is severed and the lens is completely delivered.

This method is of course only applicable in suitable cataracts and in tractable patients. The detail of these cases and the summary follow:

No.	*Age.*	*Cataract.*	*Vitreous or Complications.*	*Healing.*	*Final Result.*
1	59	M		Hyphema	20/40
2	70	H			20/30
3	66	I		Iris prolapse	20/70 Opac. vitr.
4	60	H	+ on replacing iris		20/30
5	56	M		Hyphema	20/20
6	67	M		Chor. detach.	20/30 Choroiditis
7	77	H		Chor. detach.	20/30
8	77	H		Iritis	20/40 Choroiditis
9	70	I			20/20
10	60	I	+ followed lens		20/30
11	60	M			20/30
12	67	M			20/100
13	51	I			20/20
14	67	M			20/40
15	74	M			20/200
16	63	I			20/40
17	60	M			20/50
18	84	I			20/50
19	71	M		Diabetes Chor. detach.	20/50
20	73	I			20/20
21	75	I		Iritis	20/20
22	56	I			20/20
23	68	I			20/40
24	56	I		Iritis	20/40
25	69	I			20/40
26	74	M			4/200 Choroiditis
27	78	H		Dementia	20/40
28	60	M		Iris prolapse	20/30
29	63	M			20/20
30	72	I			20/70 Opt. atrophy
31	70	H			20/30
32	66	I			20/70 Ret. pigm.
33	71	M			20/40
34	52	I			20/20
35	60	H			20/30
36	68	H			20/20—
37	69	I			20/20
38	73	M			20/50 Mac. Corn.
39	50	M			20/20
40	56	I			20/40
41	58	H	+ followed lens		20/20
42	73	M			20/20
43	84	H			5/200 Choroiditis
44	54	I			20/20
45	57	H			20/50 Mac. Corn.
46	77	I			20/20
47	55	M			20/20
48	61	I	+ followed lens	Iris prolapse	20/30
49	67	I		Diabetes	20/20
50	57	M		Iritis	20/20
51	77	M			20/30
52	63	M			20/20

No.	*Age.*	*Cataract.*	*Vitreous or Complications.*	*Healing.*	*Final Result.*
53	63	I			$^{10}/_{20}$
54	78	I			$^{20}/_{70}$ Exud. in retina
55	72	M			$^{6}/_{200}$ Optic atrophy
56	60	I	+ followed lens	Iritis	$^{20}/_{30}$
57	71	H			$^{20}/_{20}$
58	69	H		Iris prolapse	$^{20}/_{40}$
59	52	I			$^{5}/_{200}$ Ret. pigm.
60	54	M	+ followed lens		$^{20}/_{20}$
61	65	H		Iritis	$^{20}/_{20}$
62	57	I			$^{20}/_{30}$
63	77	I			$^{20}/_{50}$ Choroiditis
64	55	I			$^{20}/_{20}$
65	66	H			$^{20}/_{40}$ Choroiditis
66	63	I			$^{20}/_{20}$
67	57	M			$^{20}/_{30}$
68	72	I			$^{20}/_{20}$
69	60	M	+ on replacing flap		$^{20}/_{30}$
70	67	I			$^{20}/_{40}$
71	56	H			$^{20}/_{40}$
72	65	I			$^{20}/_{20}$
73	62	I			$^{20}/_{30}$
74	71	M			$^{20}/_{40}$
75	69	I			$^{20}/_{30}$
76	65	H			$^{20}/_{70}$ Choroiditis
77	57	M			$^{20}/_{20}$
78	55	M			$^{20}/_{20}$
79	55	I	Projection ?		P. L. Vitr. exudate
80	64	I			$^{20}/_{20}$
81	65	M			$^{20}/_{50}$ Optic atrophy
82	58	H			$^{20}/_{30}$
83	67	H			$^{20}/_{20}$
84	60	M			$^{20}/_{20}$
85	59	M			$^{20}/_{20}$
86	65	I			$^{20}/_{20}$
87	69	I			$^{20}/_{20}$
88	42	I			$^{20}/_{20}$
89	70	M			$^{20}/_{20}$
90	65	M			$^{20}/_{50}$ Mac. corn.
91	56	M			$^{20}/_{20}$
92	68	M			$^{20}/_{20}$
93	63	I			$^{20}/_{20}$
94	35	I			$^{20}/_{200}$ Ret. pigm.
95	70	M			$^{20}/_{40}$ Choroiditis
96	68	I	+ on removing speculum		$^{20}/_{60}$ Choroiditis
97	79	M			$^{20}/_{40}$
98	55	I	+ on replacing iris		$^{20}/_{60}$ Opac. vitr.
99	56	M			$^{20}/_{20}$
100	49	I			$^{20}/_{20}$

SUMMARY: Hypermature 18. Mature 38. Immature 44: (Incipient 19, Nuclear 13, Posterior Cortical 11, Punctate 1).

Uncomplicated 78:	Visual results $\frac{20}{20}$, 43; $\frac{20}{30}$, 14; $\frac{20}{40}$, 14; $\frac{20}{50}$, 4; $\frac{20}{70}$, 1; $\frac{20}{100}$, 1; $\frac{20}{200}$, 1.	
Complicated 22:	Maculae corneæ	3
	Central chorioretinal changes	12
	Optic atrophy	3
	Retinitis pigmentosa	3
	Old vitreous exudate	1
Vitreous prolapse 9:	This occurred:	
	On replacing iris pillar	2
	" " conj. flap	1
	On removing speculum	1
	Directly followed lens	5

Vision obtained in vitreous prolapse cases: $\frac{20}{20}$, 2; $\frac{20}{30}$, 5; $\frac{20}{60}$, 2.

Iritis	6
Iris incarceration or prolapse	4
Detachment of choroid (transient)	3
Capsule ruptured during extraction	0
Retrochoroidal hemorrhage	0

Of the 78 uncomplicated cases 71 obtained vision from $\frac{20}{20}$ to $\frac{20}{40}$, i.e., 90%. The vision of the others is underestimated as the patients were illiterate and there was no optical cause for the reduced vision. The number of vitreous prolapse is reduced in this series; it occurred at the end of the operation and was very small in amount. While I do not wish to minimize escape of vitreous, the visual results of this group speak for themselves. The drawback to vitreous is the difficulty of replacing the iris columns, the interference with normal wound healing and obstinate vitreous opacities. Under iritis is recorded any redness of the eye, persisting longer than the average time. These intracapsular eyes are unusually free from any reaction. Hyphema is peculiar in these cases, as the blood seems to particuarly adhere to the hyaloid membrane, where it may remain for months.

It is sometimes difficult to grasp the capsule, then the blades must be still further opened and, as in Morgagnian cataracts, the lens bag seized as near the equator as possible. A better hold can also be obtained by tilting the handle of the forceps forward, thus engaging the pointed extremities, though the capsule thereby is more apt to tear.

The percentage of cases in which this subluxation succeeded is about 50% and remains about the same as in the first series.

This phase of the subject is taken up in an article which appeared in these ARCHIVES (vol. l., March, 1921). A suggestion is there made that an attempt to increase the number of successful subluxations be made, by adding, if the subluxation does not promptly take place, pressure with the Smith hook at the lower limbus straight back, thus increasing the intravitreous pressure.

I have been practicing this method now for more than 10 years and an opportunity has been given to examine the late results. I have found no instances in which the eye has suffered any late deterioration or change which might be ascribed to the method of operation. The eyes remained sound and the vision excellent. No case has returned with glaucoma. When extraction was required in cases which had been trephined for glaucoma and later developed cataract, the cataract was easily subluxated and extracted in the capsule and the glaucomatous process did not return. A good deal has been said in criticism of the intracapsular operation from the standpoint of consequent changes in the anterior layers of the vitreous. I have failed to find these changes in the cases operated on by subluxation with the capsule forceps. Updrawn pupils do not occur unless there is vitreous loss, and the shape of the pupil is usually the same as after the capsulotomy operation. Nor have I seen an after-cataract develop. Iris prolapse need not be any more frequent after the intracapsular than after any other method, provided due care is taken to replace the iris columns.

I am more than ever convinced that extraction in the capsule should be our goal and that subluxation by any procedure except by external pressure should be adopted. I realize the shortcomings of a capsule forceps and hope that the question has been solved by Barraquer and his suction method. In any case the operation cannot be made an easy one and requires familiarity and training in the intracapsular technique so brilliantly devised by Henry Smith. Whatever method is finally found to give the best results, it is but the outcome of this pioneer's work.

MELANOSARCOMA OF THE CHOROID OCCURRING IN BROTHERS.[1]

By Dr. ADOLPH O. PFINGST, Louisville, Ky., with Pathological Report by Dr. STUART GRAVES, Louisville, Ky.

(*With three illustrations on Text-Plate XXIV.*)

INASMUCH as malignant growths of the eye occurring in more than one member of a family have never been recorded in medical literature the report of two cases which recently came under my observation may be of interest.

W. B. G., farmer, age 44, consulted me in February, 1919, with the history that he had noticed a dimness in vision of the left eye a year previously and that the vision had decreased so that by June of that year he could just about differentiate between light and darkness. Diagnosis of retinal hemorrhage was made at the time by the late Dr. Wm. Cheatham. The patient had never had eye trouble of any kind and he gave no history of an injury to either eye. His general health had always been perfect. Family history extending back two generations was negative as regards malignancy. His mother died at 36 of heart trouble following rheumatism and his father was in good health at 80 years. He has, besides the brother included in this report, one sister, age 50, and a brother of 37, both in good health. Examination showed a robust, well developed man of healthy complexion, light brown eyes. The right eye was normal and had perfect function. The left showed an extensive detachment of the retina on the temporal side and upward. Tension taken with McLean's Tonometer was normal. The retina on the nasal side was responsive to light. This man absented himself for a year when he returned with the history of severe pain in the left eye of two weeks' duration. He was found to be in an acute attack of glaucoma—with hazy cornea, shallow anterior chamber, increased tension, etc. Interior of the eye not recognizable. Wuerdman's Transilluminator showed darkness on the temporal side. Based upon this increased tension and the knowledge of a previous detachment of the retina, the diagnosis of intraocular tumor was made, enucleation advised and allowed. The removed eyeball was fixed in 5 per cent. formaline solution. Anteroposterior section extending through the optic nerve and the middle of the cornea revealed a globular mass about the size of a pea close to the entrance of the optic nerve on its temporal side. The tumor mass had a light chocolate brown color. The retina was entirely detached. The specimen was sent to Dr. Stuart Graves of the University of Louisville for microscopic report.

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[1] Read before American Ophthalmological Society, Swampscott, Mass., June 15, 1921.

Case 2.—Farmer, age 47, while at my office on April 1, 1921, with his brother whose eye had been removed a few days previously, made an inadvertent remark that he felt sure that he had in one of his eyes the same trouble as his brother. He based this belief upon the fact that he had noticed a hairlike body before the left eye for six or eight weeks and that his vision was obscure on one side. As this history was given in a passing way, no attention was paid to it and no examination was made. A few weeks later while on a visit in Washington, he consulted Dr. W. H. Wilmer who made a diagnosis of intraocular tumor and advised enucleation.

Personal history in this case was negative—no history of traumatism nor of any inflammatory eye disease. Family history same as brother. Examination which was made at my office on April 20th, revealed by focal illumination on the temporal side a mass in the vitreous chamber close behind the lens which seemed to be protruding from the ciliary body and which extended to the edge of the normal pupil. Wuerdman's Transilluminator showed the temporal half of the eye darkened. Tension was normal. There was no inflammatory reaction, the exterior of the eye being normal. Vision had been reduced to a perception of light on the nasal side of the retina. The right eye was nomal. Vision 20/15.

The left eye was enucleated on April 23d and placed in formaline solution. Anteroposterior section disclosed on the temporal side a black globular mass about ½ inch in diameter of smooth contour and covered with retina. It seemed to spring from the choroid anteriorly and to extend backward beyond the equator of the eye and far into the vitreous cavity. The specimen was submitted for microscopic report.

Pathological Report (Graves):

CASE 1.—*Gross Description:*—Specimen consists of one-half of eye 26*mm* in diameter. It has been cut in middle of plane of optic nerve, dividing latter; in cut surface, springing from junction of retina and nerve, extending laterally from nerve 11*mm* and extending into vitreous 5*mm* is a chocolate gray, rather spongy tumor. Opposite half, when split at right angles, reveals apparently same kind of tumor about three times as large.

Microscopical Description.—Sections show tumor made up almost entirely of spindle cells supported by very scanty stroma and few blood vessels, those present appearing more as blood channels lined with endothelium and without normal vessel wall. The tumor cells lie in interlacing bundles and contain rather elongated, oval, pale nuclei. In cytoplasm of some cells is an abundance of brownish, finely granular pigment, but these pigmented cells are irregularly distributed and, when section is viewed under low power, are comparatively scanty. Mitoses are very few. Microscopical diagnosis, melanoblastoma (melanosarcoma).

CASE 2.—*Gross Description:*—Specimen consists of half of eye, 27*mm* in diameter. Springing from one wall and involving one half of vitreous chamber is dense, homogenous mass of dark brown, almost black substance. The neoplasm extends from region of ciliary body, which seems to be involved in the tumor mass, backward about 22*mm* to a point about 12*mm* from anterior to the optic nerve. Retina is separated and pushed to one side by this mass. Layer of vitreous humor 4*mm* thick is present between the dense mass and the separated retina. Specimen split at right angles to anteroposterior axis shows the dark mass to be rounded about 12*mm* in one diameter and 20*mm* in the other.

Microscopical Description:—Sections of this tumor show general structure similar to that first case, but the pigmentation is so exceedingly abundant that even a thin section appears almost black and the cell structure is largely obscured; under high power outlines of cells can be seen and these outlines frequently sharply circumscribe the pigment deposit.

It becomes manifest at once that these cases offer nothing of especial interest regarding the points of origin of the growths or their histological structure nor does the individual case present any unusual clinical features. However, the occurrence of identical growths in brothers at about the same time of life is so very unusual that a report of the cases for the sake of future reference seems warrantable. It would seem that as long as the ætiology of malignant growths remains as obscure as it is to-day any data that might eventually be of value in determining this problem should be placed on record.

It is well known that after these many years of research nothing definite has been established regarding the causative agent of malignant growths or in fact of tumors in general. The much quoted hypothesis promulgated by Cohnheim that tumors develop from superfluous masses of simple or complex tissue misplaced during embryonic development, although not universally accepted, still has many adherents who look upon the frequent origin of new growths from congenital abnormalities such as the development of melanomata from pigmented moles and pigmented spots in the uveal tract of the eye as the chief support of this theory. Cohnheim also saw in the frequent development of malignant growths at the muco-cutaneous junctions strong supporting evidence of his embryonic theory. While Cohnheim's hypothesis does not explain why the displaced embryonic cells may lie dormant for years and finally either atrophy or produce new growths, the assumption is warranted that the primary cause of neoplastic growths may be assigned to some cell disturbance, either of an embryonic nature or of a later development and that the various conditions assigned by pathologists as probable causes are merely determining or exciting factors in the individual case. Whether the disarrangement of cells always takes place during embryonic development or whether Ribbert's modification of the embryonic idea that the isolation of the cells which eventually produce the growth probably occur in adult life through the irregular growth of the tissue, it must be remembered that every group of misplaced cells does not form a tumor the development probably depending upon favorable conditions of nutrition and the activity of some exogenous influence.

In recent years it has been suggested that the growth of these dormant misplaced cells is ordinarily prevented by the existence in the organism of some chemical or biological influence of an unknown nature, but probably emanating in the ductless glands of the body, and that a perversion of this internal secretion either by an over-production or an insufficient absorption annuls the inhibitive influence over cell growth. It is suggested by the exponents of this theory that the misplaced cells relieved of the retarding influence of the conjectural endogenous substance become susceptible to exogenous influences which then serve as the determining cause of tumor development. While the theory seems reasonable it must be admitted that it is not based upon adequate facts.

Much time and thought has been given the endeavor to determine the relation between tumor development and certain external exciting influences. All efforts to transmit malignant growths by inoculating living tumor cells or the filtrate of the tumor in the human have been futile. We know, too, that there is at present no direct evidence of a bacterial cause of tumor development or of any other definite extrinsic influence and yet we are all familiar with the many instances in which injurious influences of all sorts preceded the development of tumors, making the causative relation between them extremely suggestive. Nevertheless, we cannot conceive of such injuries causing tumor growth without assuming the existence of some abnormality in the tissue involved. The irritants which by Virchow were called formative irritants and which are now looked upon merely in the light of contributory factors in tumor development, are not necessarily the result of one direct violence but may be due to long continued influences of mechanical, chemical, or bacterial irritation, associated with inflammatory infiltration. Common examples of this kind are seen in the pipe smoker's epithelioma of the lip, malignant uterine growths following long continued acrid discharge, etc.

In considering the exogenous causes of tumor development, it is quite natural to look to parasites, either of animal or vegetable nature as etiological possibilities, though up to the present time growths have not been produced experimentally by inoculation nor have bacterial inclusions been demonstrated in cells of new growths. McCallum (1) believes that bacteria in order to cause cell growth must be so included in the growing cells as to multiply with them and accompany them wherever they go, since otherwise it would seem impossible that they could maintain their stimulating effect upon the cells which have been transplanted to distant organs. Some twenty years ago pathologists believed to have found within the protoplasm of tumor cells bodies which they considered as protozoa. As late as 1913 Rohdenburg (2) expresses the belief that the existence of blastomycetes in malignant tumors could be regarded as certain and irrefutable. However, later observers have proven that the variously described inclusion bodies were due to degenerative changes in the cell protoplasm and that they bore no ætiological relation to the tumor. Where protozoa were really observed it subsequently developed that the growths containing them were granulation tissue and not sarcoma.

The incidence of heredity in the development of neoplasms, especially as regards the development of malignant growths, has perhaps received more discussion than any other phase of the subject. Although evidence is accumulating in recent years based upon experimental study with mice and other lower animals by Dr. Maud Slye and others, indicating that malignant growths can be transmitted by transplantation of tumor cells in animals and that several generations following the occurrence of the disease in an animal are prone to develop a like condition, yet we have no corroborative evidence in the human in which all inoculation efforts have failed. The frequent appearance of similar growths, especially of a malignant type in different generations of a family, would make it appear to the casual observer that there frequently is a family predisposition to tumor formation, yet statistical proof to warrant this belief is wanting and it is now pretty generally conceded that heredity does not play a notable part in tumor development. As it is practically impossible to obtain complete family histories through more than two or three generations, and as collected figures represent the minimum rather than the maximum of familial growths, there is difficulty in drawing accurate conclusions, hence statistical proof regarding heredity is necessarily unreliable. As evidence of the uncertainty of such statistics, Warthin (3) relates his observations that among 3600 cases of neoplasms of all kinds seen at the University of Michigan from 1895 to 1913 complete family records could be obtained but 13 times. In view of the statistical data indicating an infrequent hereditary tendency to the development of neoplasms and based upon the great frequency of growths, especially those of a malignant type, it is a reasonable assumption that the cases of tumor producing potentiality in families rather followed the law of chance and that the development of tumors in different members of the same family was merely coincidental.

Melanotic sarcoma (melanoma, melanoblastoma) of the uveal tract represents the most frequent variety of tumors of the eyeball occurring in adults. According to Fuch's statistics it occurs in .07 per cent. and Wintersteiner in .05 per cent. of ophthalmic cases. Most cases are observed between the 40th and 60th years. All reported cases of melanoma of the uveal tract have been primary growths, no instance of metastic growths of the eye having been recorded. As far as is known they are always malignant and they frequently give rise to metastases by way of blood and lymph. They spring from any portion of the tract but most frequently from the choroid and are believed by Ribbert (4) and others to be the result of proliferation of the meoblastic cells and a differentiation of many of the cells into pigmented cells or melanoblasts. The cells are of a definite type, usually spindle shaped and are characterized by the production of pigment within the cytoplasm in the form of granules, varying in color from a light brown to a black. The great majority of sarcomas of the uveal tract are pigmented though the origin of leucosarcoma in the pigmented coat of the eye is not uncommon.

Whereas malignant tumors have been known to occur in the eye even before the time of Hippocrates little or nothing was known of their pathology until the early part of the 20th century when the advent of the microscope opened up a new era in the study of malignant growths. But even with this important adjunct added to our methods of research the ætiology of tumors of the eye is as obscure as it was years ago and as it is regarding tumors in general.

Applying the theories of the cause of tumors to melanoma of the choroid and ciliary body it would seem that tumors develop in the eye under conditions similar to those which have been thought to influence the development of neoplasms elsewhere and nothing is definitely known of their specific ætiology. Borst (5) like Cohnheim, believes that during embryonic growth a superfluous and imperfect tissue develops in the uveal coat. He believes that an overproduction of pigment takes place in isolated cell growths which predisposes to cell proliferation and to the formation of new growths. Others (6) believe that some form of inflammations in the uveal tract results in the formation of scar tissue from which the neoplasm takes its origin. Fuchs (7) who approved this theory classed these inflammations with the traumatic causes in his count of eleven per cent. of cases among 259 sarcomas of the uveal tract in which he assigned trauma as the cause of uveal growths. If these cases were eliminated a history of trauma could not be elicited in many instances of tumors of the interior of the eye. The large number of tumors of the uveal tract that have been reported and the infrequent instances in which trauma was assigned as the causative agent and the position of the uvea protected from all kinds of traumatic influences seems to controvert the theory of trauma acting as an exciting cause of the development of eye tumors.

The protected positions of the middle coat of the eye would also lend little support to the parasitic theory of tumor development, even as a contributory cause.

As far as our present knowledge goes there is little evidence of heredity influencing the development of ocular growths. Regarding the influence of heredity on the development of melanoblastma of the eye, Wintersteiner (8) points out the fact that the entire ophthalmic literature contains but two cases that were suggestive of an hereditary influence in the development of eye tumors. One of these cases reported by Silcock (9) which has been frequently quoted occurred in a girl of 20 whose eye was removed on account of melanosarcoma of the choroid. Her mother at the same age had one of her eyes removed for the same reason while her maternal aunt died of a malignant growth of the breast and the maternal grandfather of a melanoma of the choroid. Notwithstanding this pronounced case Wintersteiner concludes that heredity is not an important factor in the ætiology of neoplasms of the eye.

Whether the occurrence of two identical growths springing from the same structure in the eye developing in brothers at about the same time of life will prove to be of future value in determining the ætiology of eye tumors is problematical. For the present it would seem that heredity played no part in their development, and that their occurrence must be looked upon as one of those rare coincidences that are at times encountered in the practice of medicine.

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PRACTICAL POINTS IN CATARACT EXTRACTION EMPHASIZED IN COL. HENRY SMITH'S TECHNIQUE FOR INTRACAPSULAR EXTRACTION.[1]

By Dr. CLARENCE KING, Cincinnati, O.

DISCUSSIONS of the Smith operation have usually centered in the question of its acceptance or rejection as a routine method of cataract extraction. This tendency has diverted attention from the fact that many features of Col. Smith's technique can be incorporated into the old operation with striking advantage. Every operator owes it to himself to devote the closest scrutiny to the details of any method which has received the sanction of Col. Smith's vast experience, and should endeavor to give his recommendations as wide an application as possible in his own practice. In making this effort, one will realize what a tremendous service Col. Smith has rendered to ophthalmology in stimulating oculists to strive for the attainment of the highest ideals in cataract surgery and in stifling that complacency which makes for contentment with present methods.

In considering cataract surgery, one cannot help being impressed by the extent to which the success of the operation depends upon the perfection with which the details of technique are carried out. All eye surgeons have encountered difficulties during operations; and we know, theoretically and practically, the troubles that beset the knife of the unwary. On analyzing the cause of some occurrence which we might wish to have avoided, we almost invariably find that it had its inception in the failure of some seemingly insignificant detail of our procedure. After the groundwork of an operator's technique is established, it is in its details that we expect to modify it to advantage. This emphasis of detail will afford, it is hoped, some justification for a brief reference to technical points which are apparently trivial in a verbal description but which, as part of the sequence of a cataract operation, have a cogently practical importance.

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[1] Read at meeting of Ohio State Medical Society, Columbus, Ohio, May, 1921.

It was the good fortune of the essayist to have spent a cataract season as Col. Smith's guest at Amritsar and to have had the privilege of doing two hundred and six intracapsular extractions under his supervision. To the observer of Col. Smith's work, it was manifest that in evolving his technique for extraction in capsule, he had made valuable contributions to cataract surgery in general. The observations that follow are derived from notes made at the time of the visit mentioned. Successive steps of the intracapsular operation are considered in relation to their availability for the capsulotomy method.

In preparation for the operation, Col. Smith's method of flushing the conjunctival sac attracts our attention. This preliminary can be employed profitably in any operation on the eyeball, as the entire surface of the sac can be definitely exposed to the action of the flushing fluid. Briefly, the procedure is as follows:

The speculum is inserted and opened. In this position, it is drawn directly forward by one hand, thus lifting the eyelid from the eyeball, while the fingers of the other hand are occupied in grasping the eyebrow and sliding it upward. This manipulation exposes the fornix with the minimum of mechanical irritation to the action of the fluid used.

Two details characterize Col. Smith's method of fixation. He braces the ulnar side of his left hand and little finger against the patient's cheek and side of the nose. To use his own expression, he has "the feeling that he controls the patient's head between his hands." He points out that improper support of the fixing hand is often the cause of that pressure with the fixation forceps, which we all know is so disastrous. A second point typical of his fixation is that after he has taken hold in the usual position, he gives a quarter turn to his forceps. This maneuver gives a more certain grip.

There is an old French adage to the effect that as the incision is, so is the operation. Although some surgeons are not disposed to agree with this generalization, they will admit that the incision plays a predominate part in the success of a cataract operation. All who have worked with Col. Smith must have been impressed with his marvelous dexterity and facility in making an incision. To one who was familiar only with the traditional "to-and-fro" sawing motion, it was astounding to see, quite frequently, a section completed by one straight, smooth thrust of the knife without the least bit of withdrawal. It was immediately obvious that this facile motion was no mere spectular flourish; for the symmetry of the section, the smoothness of its edges, and the ease with which it was completed, disclosed its many advantages in promoting the ready healing of the wound and in minimizing trauma. The outstanding features of Col. Smith's incision are that it is made by finger movement *only* and that there is no short sawing back and forth. He crosses the anterior chamber slowly. Immediately after the counter puncture is made, the handle of the knife is depressed; the knife is thrust upward; the upthrust occurs more rapidly than the through thrust, and severs a large part of the inner, upper corneal quadrant. As the knife is farther advanced, the handle is elevated so that with the proximal end of the blade, the outer upper corneal quadrant is sectioned. This manipulation brings the blade horizontal; and if its cutting surface has been used up, a slight withdrawal suffices to cut the remaining corneal bridge. In some cases, at this point in the incision, advancement is still possible; and the section is completed by advancing the knife to the heel without withdrawal. This maneuver implies a definite way of holding the knife. Col. Smith gives the following description:

"In holding the knife, an operator should catch it as one holds a pen in writing and hold it, if anything, more lightly. His hold of the knife should be fairly long; that is, a good distance from the blade. The back of the terminal joints of the little finger should rest against the front of the temple and the ring finger should rest on the little finger and against the temple; the fingers and thumb, holding the knife when in the straight position as a pen in the act of writing, should now be drawn back without shifting back on the handle of the knife, as far as convenient, so that they look in the position of a partially closed fist."

Wrist motion in the incision implies sawing and has not the delicacy of the finger motion. A section made principally by wrist action is the logical consequence of certain methods of holding the knife. A traditional hold of the knife which predisposes to wrist motion is described by Czermak in *Die Augenärztlichen Operationen.* A translation is as follows:

"The knife is not held like a pen. It is gripped with the thumb on one side, and the index and middle fingers on the other side in such a way that the axis of the knife makes a right angle with the axis of the thumb. The elbow should be applied to the body, and all movements should be made with the wrist."

It is to be noted that the thumb is extended and braced against the pull of the index and middle fingers. These methods are explicitly contrasted in order to direct attention to the fact that an operator may frustrate his purpose to make use of the delicacy of finger motion if he uses an unsuitable grip to which he had previously become accustomed. It may be useful in this connection to suggest that the maximum finger motion takes place in a cataract incision if the knife is held in the direction of the long axis of the fingers and thumb; and that the greatest restriction occurs if the knife is held with a short grip at right angles. Briefly, Col. Smith's incision is a thrust with the fingers, a withdrawal taking place if necessary. Its merits commend it to our careful study.

A consideration of the cataract incision naturally turns our attention to the lens that must pass through it. Many operators are skeptical as to the possibility of making an accurate prediction about the contents of the capsular sac; they look upon any forecasts as having no value in practice. In Col. Smith's clinic, great attention was paid to the probable size, shape, and consistency of the lens. In certain typical cataracts, an accurate prediction could easily be made. Attention to this detail by the operator during the capsulotomy extraction will very often enable him to be prepared for an emergency which might otherwise take him by surprise.

One feature of Col. Smith's method of iris reposition can be worthily applied to the old capsulotomy operation. In replacing the iris after iridectomy Col. Smith not only strokes the pillars into position in the usual way but also passes the repositor upward in the direction of the ciliary body to free the root of the iris from the upper lip of the wound. He lays great stress upon the fact that during this maneuver all pressure must be removed from the eyeball by the lid-hook. This method of replacement is especially useful where a corneal section has been made, but obviously it has a wider application.

In his book on the treatment of cataract, Col. Smith recommends the strabismus hook for expressing the lens in the capsulotomy operation. The operator stands behind the patient's head, makes slight pressure on the sclera above the wound with Smith's spatula held in the left hand and applies the convexity of the end of the hook to the lower part of the cornea. He then makes steady pressure upward toward the wound, following up the movements of the lens by sliding the hook up after it. Col. Smith insists that no relaxation should occur after the nucleus has escaped but that steady pressure should be maintained as the hook follows the escaping cortex up to the edges of the wound. One way for an operator to convince himself of the value of the strabismus hook for this purpose is to use some other method to express the lens in a case with a good deal of cortex and to persist until no more cortex can be expelled, and *then* to try the strabismus hook. In many such cases he will be gratified to find that more cortex can be expressed without dangerous pressure. The result may not be as satisfactory as it would have been if the hook had been used as indicated in the beginning; but the trial affords a good way to make comparisons, and the disadvantage will not be with the instrument which Col. Smith recommends for the purpose.

The reference to the strabismus hook suggests the way in which he uses the spatula and hook in the intracapsular operation when vitreous loss is impending as the lens is being delivered. When vitreous presents between the lens and the upper lip of the wound, Col. Smith passes the spatula into the wound. Holding it steadily and using it to hold back vitreous and to act like an inclined plane he uses the strabismus hook to slide the lens upon it. The extent to which the spatula has to be introduced varies according to the conditions present.

If the vitreous merely presents itself in the wound, only the tip is entered. If a large amount of vitreous is lost and the lens is dislocated, it has to be passed well into the vitreous. The important part is that, in any case, it acts as a plane upon which the lens is caused to glide upward. Reisinger's double hook or a spoon or a loop have usually been employed for this purpose in the past.

In all these maneuvers, especially when the patient is unruly, Col. Smith's method in controlling the lid is of the utmost usefulness. The one using the hook stands at the patient's left. The hook is passed under the upper lid, is inserted at the outer angle and slid gradually toward the center. A short grip is taken on the hook with the thumb and index fingers of the right hand. The shaft is held between these fingers as one would hold a pen. The other fingers are employed to push the brow upward; their nail surfaces are applied to the brow, and the brow is pushed up over the orbital margin by extending them. The lower lid is drawn down by the left thumb, the left hand and fingers being applied to the patient's cheek. All the connections between the eyeball and its bony framework are drawn forward, and the eye sinks toward the apex of the orbit.

The writer is aware that all those who concern themselves with the cataract operation are familiar with the literature of the subject in which the above procedures are described. They have usually been considered exclusively part and parcel of the intracapsular operation. It appeared that a useful purpose might be served to recall and briefly summarize, for those who do not do the intracapsular extraction, certain features of the Smith operation which have been proved to be of extreme value in the older method and which are, of course, but incidental phases of Col. Smith's greater contribution in giving to Ophthalmology, and thus to humanity at large, his method for the intracapsular extraction of senile cataract.

TREATMENT AFTER CATARACT OPERATIONS.[1]

By Dr. J. W. MILLETTE, Dayton, Ohio.

THE treatment after any operation is of paramount importance, and the biggest part of the problem is to make conditions most favorable for Mother Nature to do her work with the least effort and in the shortest time. My belief is, that this is done most perfectly when the ordinary routine of life is least disturbed.

It is wise to disturb the psychic, nervous, and physical routine of the patient just as little as possible. His sensibilities, his feelings, his manner and habits of thought should be kept going along in their accustomed ways. His sleeping and eating, his goings and comings, should be altered just as little as is consistent with the nature and care of the lesion.

There will probably be a general acceptance of this principle, but a very wide divergence as to its application.

Through several years of quite close observation of the healing process following cataract operations, I was impressed with the universal complaint concerning the back; with the rather frequent mental disturbances; with the suffering at times from acute retention of urine, and more or less renal disturbance. When it fell to my lot to take the responsibility for these patients, I felt constrained to find relief, if possible, from these conditions.

Tradition and conservatism so bind us and hedge us in that in the presence of a great responsibility we are likely to be timid, but what seemed absolutely necessary here was relief from at times almost intolerable suffering. To lie on one's back for twenty-four or forty-eight hours or longer is a task to tax the endurance of a much stronger and more patient person than is a great proportion of cataract patients. I wondered if this could not be less rigidly enforced and no harm be done.

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[1] Read before the Ohio State Medical Association, May 4, 1921, Columbus, Ohio.

Acting in accord with the belief expressed above and this hope, greater freedom of action was granted. The patient's body was turned toward the side of the unoperated eye, when he complained of his back. Later, the head, which previously had been placed between sand bags to help him retain it in position, was shifted. A considerable measure of relief was obtained and gradually more and more freedom was given with less and less suffering until at present the custom is not to inhibit the freedom in any marked degree except during the first twenty-four hours.

Generally speaking the treatment is routine and symptomatic. The routine procedure is as follows:

Immediately after the operation the eye is closed naturally and gently. Vaseline is placed over the lids of both eyes and a half round pad is placed over each eye. Over this is placed a full round pad of the same structure. These are fastened on with adhesive strips. Over this, over the operated eye, Dr. Fox's aluminum shield is placed and secured with adhesive strips. Over both eyes next is placed another pad and a mask. I am convinced that most of this is quite unnecessary but so far have not had the courage to break away from custom.

The patient is instructed to lie perfectly quiet, but if he complains of his back, he is turned to the side opposite the operated eye.

On the morning following the operation the bandages are removed, the eye opened and examined. Usually the anterior chamber has formed and the wound is closed. The eye is again closed after gently bathing the lids with a boracic acid solution. The half round pad and the full round pad are placed over the operated eye. The patient is given the use of the unoperated eye.

On a great many of these old people, the effect of keeping the eyes bandaged seems to be to bewilder and confuse the mind, inducing a feeling of fear and a desire to protect himself from impending danger. A form of dementia, more or less violent, may follow which may or may not cause harm to the eye, but certainly is very distressing to all concerned. Since adopting the above procedure we have had no post-operative dementia. During this first day after the operation the patient is given a back rest and permitted to sit up in bed.

On the second morning the eye is dressed again and a pad hung loosely over the eye, giving perfect freedom for the lids. The patient is permitted to sit in a chair. From this on almost absolute freedom of action is given him. The eye is kept shaded since the light is borne rather poorly by the sensitive retina.

On the third or fourth day dark glasses and a brow shade are prescribed. The patient is kept in a somewhat darkened room for several days. Each night a pad is placed over the eye and over this a metal shield or mask to protect the eye from the sleeping patient. Usually at the end of a week or ten days the eye is ready for a preliminary test of vision. Glasses are fitted after two or three weeks. A change may be necessary after several months.

Under this routine, suffering in the back—post-operative insanity—bladder and kidney troubles have been practically eliminated. There have been fewer inflammatory processes and several probable infections aborted. Perhaps the most pronounced result obtained by this more or less open treatment, has been the relief from acute retention of urine and absolute freedom from kidney lesions. One of the most severe cases of acute retention I have seen and one that influenced me most in this form of after treatment, occurred four years ago.

Mr. S. W. D., eighty-one years of age, operated on about 8.30 in the morning, in his bed at his home. Trained nurse in constant attendance. In the early part of the afternoon he complained of some distress in the region of the bladder. In the evening his family physician was called and relieved him with a catheter. He had an uncomfortable night and when I called the next morning about eight o'clock, I found him standing beside the bed with a urinal doing his best to void the urine. I had him lie down that I might examine the eye, expecting to find everything gone wrong. On the contrary the wound was closed, no redness, and all was looking well. He was given the other eye and granted permission to sit in a chair or walk about the room. His physician looked after the bladder trouble which continued for several weeks. The eye became slightly inflamed and was treated with atropine for a week or more, but went on to recovery with $\frac{20}{15}$ distance vision and ability to read Jaeger one with ease. The patient lived nearly four years after this operation and retained his vision to the end.

This form of treatment, or lack of treatment, gives an excellent opportunity to do what is possible to avoid or abort an infection. To bandage the eye and keep it bandaged makes a very good incubator, since the three essentials of an incubator are all supplied, namely, warmth, moisture, and darkness.

Under symptomatic treatment are included all complications which may occur, such as prolapse of vitreous or iris, delayed healing of the wound, and any inflammatory processes such as iritis, iridocyclitis, keratitis, conjunctivitis, and so forth, inflammations of the cornea, iris, and uveal tract are given the ordinary treatment with atropine and dionin.

Hernia of vitreous or iris, I let alone, and get the patient on his feet. Presuming that the incision is made upwards, I am convinced that the urge from within the globe is not so great on the wound when the patient is in the upright position as in the prone. There being less strain or tension on the wound, it heals more rapidly. The hernias usually will reduce without manipulation.

Briefly then: believing that the best treatment is that which interferes least with the patient's psychic and physical activity, I have attempted to relieve him, wherever, whenever, and as soon as possible of anything which might disturb the ordinary functions of mind and body, and yet keep well within the bounds of safety so far as the healing of the wound is concerned.

GLIOMA RETINÆ TREATED BY X-RAYS WITH APPARENT DESTRUCTION OF THE TUMOR AND PRESERVATION OF NORMAL VISION.[1]

By F. H. VERHOEFF, M.D., Boston, Mass.

(From the Massachusetts Charitable Eye and Ear Infirmary.)

THE first attempt to treat a glioma retinæ[2] by radiation was made in 1914 by Axenfeld (1) who employed X-rays and mesothorium. The result at first seemed successful, although a cataract developed which required operation, but recurrence of the growth took place within three years after the beginning of the treatment, and the eye was enucleated. Subsequently other unsuccessful attempts have been reported by Kusama (2) (3 cases), Janeway (3) (2 cases), Knapp (4) (1 case).

In each of Kusama's cases both eyes were in the second stage, and were treated by exposures to X-rays and radium. Shrinkage of all six tumors took place, accompanied by shrinkage of the eyeballs. Death from metastasis occurred in each case; in one 11 months, in another 18 months, and in the other case 27 months, after the beginning of the treatment. In two cases there were general metastases, while in the other the patient died with symptoms of intracranial involvement. Kusama believed that the phthisis bulbi was due to direct action of the radiation upon the eye, but to me it seems possible if not probable that it was secondary to degenerative changes in the tumor. For it is well known that glioma retinæ may undergo extreme necrosis and thus cause degenerative changes in the eye, and even marked phthisis bulbi. I have examined microscopically the eye from such a case, reported by Dr. T. O'Connor. Kusama concluded that in his cases the treatment by radiation hastened the occurrence of general metastases. This conclusion also seems doubtful to me, because disregarding the effects of the radiation, the chances of general metastases occurring were enhanced by the facts that the cases were bilateral and none of the eyes was enucleated.

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[1] Read before the American Ophthalmological Society, June 15, 1921.

[2] The term glioma retinæ is a misnomer because these tumors never produce neuroglia, and are highly malignant, but it is so commonly employed that any other term would lead to confusion.

Janeway treated six cases of glioma retinæ with radium. Two cases were later reported in detail, one by Schoenberg and the other by Knapp, while two others could not be followed. In the two remaining cases, which were in advanced stages, no improvement followed the treatment.

In Knapp's case a glioma was discovered in the second eye 4½ years after removal of the first. The tumor consisted of two main masses and was of considerable size. Treatment with radium was followed by temporary improvement, but after six months the tumor began to enlarge and the eye was ultimately enucleated. Neither of the eyes in this case was examined microscopically.

Duncan treated with radium recurrences in the orbit after enucleation in three unilateral cases with apparent success, although eighteen months was the longest period of observation.

Up to the present, only two cases have been reported in which an eye containing a glioma retinæ has been treated with radiation with apparent success. In Hilgartner's case (cited by Schoenberg (7)), the right eye was completely filled up with the growth while the other contained only a small growth. After 84 exposures to X-rays, the right eye shrunk and the growth in the left eye resorbed. In Schoenberg's case (7) the second eye was treated with radium 3 times in 26 months, beginning 3 weeks after removal of the first eye. The tumor in the second eye consisted of a grayish white mass occupying an area a little larger than the lower nasal quadrant of the eye-ground, and a smaller grayish mass 4 — 6 P. D. in size in the upper part of the fundus. As the result of the treatment the tumor underwent retrogressive changes, but it is not stated that it became reduced in size. At the end of 3¼ years after beginning treatment the patient had vision of $\frac{20}{100}$ and the glioma appeared as a "degenerated necrosed mass." A posterior cortical cataract was observed at end of 2½ years.

In the following case, that I have to report, the tumor was much smaller than any other yet treated by radiation and the result at the present time, over three years after the treatment was begun, is remarkably successful.

Case.—Harry G. aged 17 months, was referred to me by Dr. John Kerrigan on November 22, 1917. One week previous the mother had observed a white reflex from the pupil. Two brothers, aged 12 and 8, and a sister aged 6, had normal eyes, and the family history was otherwise negative. On examination the right eye showed a typical picture of glioma retinæ at the end of the first stage—shallow anterior chamber, dilated pupil, moderate increase in tension, and a vascularized yellowish white mass in contact with the posterior surface of the lens. The left eye appeared to be normal, but without general anæsthesia a satisfactory ophthalmoscopic examination could not be made. Immediate enucleation of the right eye was advised to be followed by X-ray treatment of the right orbit and careful observation of the left eye.

November 24, 1917, the right eye was removed by Dr. Kerrigan and sent to me for pathological examination. Soon afterwards the right orbit was given five severe X-ray treatments by Dr. William Liebman at the Massachusetts Charitable Eye and Ear Infirmary.

May 2, 1918, the patient was again referred to me by Dr. Kerrigan for observation. I now found in the retina of the left eye in the lower outer quadrant a white opaque elevated mass, irregularly oval in shape and about 4 P. D. in greatest diameter. It did not reach to the limit of the ophthalmoscopic field. Near this mass, but entirely separate from it, were two small white spots each about ¼ P. D. in size. The patient was immediately referred to Dr. Liebman for X-ray treatment of the left eye, with instruction for sub-erythema dosage to be employed and the exposures to be made through a perforated lead plate so as to protect the lens and anterior part of the eye. Dr. Liebman gave the first treatment on the same day, a sub-erythema dose through a 5*mm* aluminium filter. After this, similar treatment was given once a week for three weeks, and on June 6th, June 27th, August 1st, November 1, 1918, and on January 17, 1919.

The patient was seen by me at intervals of one or two months, but without general anæsthesia it was impossible to make a careful study of the ophthalmoscopic appearances, only glimpses of the tumor as a rule being obtained. On May 23, 1918, I noted that the tumor appeared less white. On August 1st, the tumor appeared translucent and smaller in size. October 19, 1919, the patient was examined under ether narcosis. The tumor appeared translucent, somewhat smaller and less elevated. The white spots near it had completely disappeared.

April 4, 1921, a good view of the tumor was obtained. It appeared only slightly elevated, gray and translucent, and somewhat smaller than the original tumor. Its outline was fairly sharp in places, but not easily seen. No traces of the white spots could be found. A few small vessels traversed it. The retinal vessels became tortuous as they approached the tumor.

On June 8, 1921, another good view of the tumor was obtained. This time there was seen just below its center, a circular depressed area, about $\frac{1}{3}$ P. D. in size, slightly pink in color in contrast to the rest of the tumor. Its margin was sharply defined. My attention was called to this area by Dr. Schoenberg who examined the patient with me on this date. No doubt I had previously overlooked it. It suggested to me a shallow hole in the tumor, perhaps due to rupture of the retinal surface at some time. There was no pigmentation either within or around the tumor. The lens was still clear and the vitreous remained free from opacities. Owing to the youth of the patient it was impossible to obtain an accurate idea of the visual acuity, but by the use of a chart with pictures it was determined as certainly better than $\frac{20}{30}$. The mother said that according to her observation the vision of the child was excellent. Since the macula was uninvolved there is no reason to believe that the child's vision was not perfectly normal.

Pathological Examination of Right Eye.—(3403) The globe is normal in size and shape. On section, after fixation in 10% formalin, the retina is found to be completely separated by serous coagulum and to enclose a tumor mass which takes up about $\frac{3}{4}$ of the globe. The tumor extends from the optic disk to the posterior surface of the lens to which it is closely applied. It thus completely replaces the vitreous body. The anterior chamber is shallow, but not obliterated.

Microscopic Examination.—The tumor is found to be a typical so-called glioma retinæ. Perivascular arrangement of the tumor cells is well marked, and the occurrence of intervening areas of necrosis is, as usual, a conspicuous feature. Some of the areas of necrosis show calcification. Typical rosettes are extremely abundant in almost every portion of the tumor. The cells not taking part in the rosette formations have round, ovoid, or pear-shaped nuclei, and often show indistinct bipolar processes. Cells in mitosis are numerous. On one side the tumor has entirely destroyed the retina, and on the other side it is in contact with the latter and in places has invaded or penetrated it. The tumor extends up to, but has not invaded the optic disk or nerve. Small metastatic nodules of tumor cells are found on the surface of the pigment epithelium, and on both surfaces of the retina where the latter is reflected over the ciliary body and has not yet been invaded by direct extension of the growth. No nodules are found in the anterior chamber or in the iris. The growth is nowhere in direct contact with the choroid and has not invaded the latter either by direct extension or metastases.

The ciliary body is compressed by the retina. There is no peripheral anterior synechia. The iris, cornea, and lens are normal.

Pathological Diagnosis.—So-called glioma retinæ endophytum.

Remarks.—While the tumor in the right eye was comparatively large, and had given rise to intraocular metastases, it had not invaded the optic nerve or choroid so that the probability of a recurrence in the orbit was less than is often the case. It is, therefore, impossible to say whether or not the absence of tumor recurrence in the orbit was due to the X-ray treatment.

That the tumor found in the left eye was also a so-called glioma there can be no doubt. For it was certainly not an inflammatory condition, because it was not associated with vitreous opacities or other evidences of inflammation, and there is no other known non-inflammatory condition of the retina which resembles it. The treatment with X-ray caused little apparent reduction in size of the main tumor, but did cause complete disappearance of the two small white nodules situated near it. It also caused a marked change in the appearance of the main tumor, the latter losing its original opaque white appearance and becoming gray and translucent.

In Axenfeld's case in which for a time the treatment was regarded as successful, and also in Schoenberg's case, cataract developed, while in my case the lens has remained perfectly clear.

In my case the lens was carefully protected from exposure by means of a lead plate. The situation of the tumor, just behind the equator in the lower outer quadrant rendered this an easy matter, but it would seem that in any case in which the tumor could be recognized with the ophthalmoscope and in which there was still useful vision, it should be possible to make the exposure through the sclera, first on one side and then the other, and thus avoid possible injury to the lens. I am not, however, convinced that the cataracts in the cases of Axenfeld's and Schoenberg's were certainly due to radiation, because it seems possible that they might have resulted from toxins given off by the necrosed tumor masses. It is of course well known that all degenerative conditions affecting the posterior part of the globe are apt to cause posterior cortical cataract.

While in my case the results of the treatment have thus far been remarkably successful, it is possible the growth may yet resume its activity, or that another tumor may develop. In this connection Maghy's (8) case of bilateral glioma, in which the second eye did not become obviously involved until the patient reached the age of 15 years, is suggestive. As Knapp points out, a few cases of bilateral glioma have been recorded in which a small tumor in the second eye has undergone retrogression with preservation of vision, but these are so exceedingly rare that they scarcely need to be taken into account.

Judging by the large number of cases of glioma retinæ that have now been unsuccessfully treated by radiation it may seem that this form of treatment does not offer much hope of success. It is to be noted, however, that the tumors in these cases were all large, whereas in Schoenberg's case, and especially in my case, the tumor was very small. The results so far obtained, therefore, seem to render unjustifiable attempts to treat an eye by this means when the tumor is so large that useful vision cannot be expected. It is possible that even a relatively small tumor, if rendered completely necrotic by the radiation, would cause degenerative changes in the eye which would ultimately destroy all of its vision. As a matter of fact, a child affected with retinal glioma is practically never brought to the ophthalmologist until in one eye at least the tumor is so far advanced that immediate enucleation is imperative. In general, therefore, treatment of retinal glioma by radiation must be restricted to the second eye, after removal of the first, and to the after treatment of the socket to prevent recurrences. At the time of the enucleation of the first eye advantage should always be taken of the ether narcosis to make a thorough ophthalmoscopic examination of the other eye.

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SPONTANEOUS HYPOTONUS IN JUVENILE GLAUCOMA.

By Dr. ALFRED H. RIEDEL, New York.

INSTANCES of spontaneous reduction of tension, with preservation of vision, in cases of congenital glaucoma have been observed by Fuchs (1), Peters (2), Collins (3), Axenfeld (4), Carlotti (5), Kayser (6), Fage (7), Pyle (8), Reis (9), and others. This condition is, of course, different from reduction of tension following pathological causes, such as inflammation, detachment of the retina or rupture of the eyeball, which often usher in the terminal stages of this disease (Axenfeld (10), Knapp (11)).

Theories attempting to explain the spontaneous reduction of tension in glaucoma have been advanced by Axenfeld (4), Collins (3), Fage (7), and others, and will be referred to later in this paper.

It is generally agreed that infantile glaucoma is brought about by arrest of development of structures at the filtration angle. The most common congenital defect is the total absence of Schlemm's canal, which occurs in about 50 per cent. of the cases (Hamburger (13)). The venous plexuses about the canal may also be undeveloped, or the ligamentum pectinatum retain in part its fetal structure (Reis (9), Treacher Collins (3)). The filtration angle may be solidly blocked by these structures (M. Diem (15), Chaja Spielberg (16)), or only a few retaining strands may be stretched across it from the root of the iris to the posterior surface of the cornea (Reis (14), Collins and Mayou (17), Parsons (27)). Furthermore, in favor of such a theory, speaks the fact that in nearly 50 per cent. of the cases of hypertension in the young, other evidences of arrested development, or other congenital anomalies, have been observed; such as persistent hyaloid artery, pupillary membrane, coloboma, irregularity in the size of the cornea or of the eyeball, etc. (Lõhlein (22)).

The clinical picture of hypertension in the young runs through innumerable variations from that of typical buphthalmos, beginning at birth, to glaucoma, as seen in its senile form. Clinically this is separated from the true senile form only because none of the injurious agents incidental to later life can be demonstrated. All forms of hypertension in the young, with the exception of the early senile forms, if not secondary to some other condition, are looked upon as congenital or hereditary (familiar). But here again the various forms of hypertension are so intertwined that the ungenital, as well as the hereditary form, may occur collaterally in the same family. For instance, it is recorded that three sisters had glaucoma simplex (juvenile glaucoma) while a fourth sister, not the oldest nor the youngest, showed a buphthalmos from birth (Lõhlein (22)). Furthermore, both forms have been seen in the same patient (Hirschberg (23)).

The association of congenital glaucoma with myopia is quite common; 50 per cent. of the patients are myopic, as compared with 15 per cent. of those suffering from the senile form. Twenty per cent. of those not considered frankly buphthalmic have a deep anterior chamber, a condition not seen at all in the senile form of glaucoma. The patients with deep anterior chambers are nearly all myopic, seldom emmetropic, never hyperopic (Lõhlein (22)).

Horstmann (25) and Levinsohn (26) have examined the refraction of children ranging in age from a few days to about a year. Levinsohn used the shadow test. Both worked independently, and both reached identical results, so their observations may be considered to be correct. They found that 50 per cent. of all children showed hypermetropia of 3 to 4 diopters; 10 per cent. only were emmetropic, and 2 per cent. myopic. The incidence of myopia among the population of Germany generally is about 15 per cent., and among the sufferers from senile glaucoma about the same. On the other hand, patients with congenital glaucoma, as already stated, show 50 per cent. of myopia. This shows that some congenitally myopic eyes have a tendency towards hypertension, or that myopia and hypertension arise from a common cause, or that myopia is produced after the establishment of hypertension, or, if already present at birth, is increased. The latter occurrence has been observed several times.

The following case is of interest as illustrating the spontaneous reduction of tension in a case of juvenile glaucoma occurring in a child of 13.

Case History.—Lillian B., aged 13 years, a Hebrew with dark hair, undersized, well-nourished and mentally alert, came to the Clinic of the Herman Knapp Memorial Eye Hospital on October 20, 1917, complaining of poor vision for the last five years. Vision with her glasses was R. −8.00 = $\frac{20}{200}$; L. −8.00 = $\frac{20}{100}$. Tension (Schiötz) R. 70; L. 60*mm* Hg. The pupils were irregular and reacted sluggishly to light. The anterior chambers were not uniform in depth throughout, but were not deep. The corneæ were somewhat over 12*mm* in diameter. The brown irides showed a dull luster, and their design was not well defined (aplasia or atrophy); they were apparently tremulous (though there was some doubt on this point). The anterior portions of the scleræ were bluish in color, as if they had undergone a process of stretching which permitted the uveal pigment to show through the white tissue.

The patient's family history revealed the fact that she had a near-sighted brother older than herself, there being a sister between them. The brother, like the patient, is undersized for his age and slim. The tension of his eyes was R. 40*mm;* L. 38*mm* Hg. The anterior chambers were unusually deep. The optic nerves were normal. His vision to-day is $\frac{20}{100}$ in each eye. With correction, R. −4.50 $\frac{20}{20}$, L. −5 $\frac{20}{20}$. His pupils are normal. The tension now is 27*mm* Hg. The disks are pale and show no cupping. His corneæ are 12.5*mm* in diameter. The irides are straight and markedly tremulous. There are six children in the family, of which these two are the only ones wearing glasses. The family history of the parents shows no consanguinity. The father is a tall, well-built old man. His vision is $\frac{20}{20}$ + in each eye, without glasses. His anterior chambers and pupils are normal. The mother is short and stocky; her vision could not be ascertained. One uncle is said to have lost an eye "during a fever." The Wassermann tests were not made.

The patient, on entering the Clinic October 20, 1917, was given a solution of pilocarpine to be dropped into each eye four times daily. Four days later, October 24, 1917, both pupils were contracted but still unequal and eccentric. The temporal portion of the left iris was more prominent than the other portions of the iris. The tension was R. 70; L. 60. The fields were concentrically contracted to 10 degrees in both eyes. The nerve heads were cupped and atrophic. There were no posterior staphylomata such as are seen in purely myopic eyes. On the following day the tension in the right eye was reduced to 56*mm* and in the left eye to 50*mm*.

On October 25, 1917, the patient was admitted to the Hospital for observation. Her vision at this time was: R. $\frac{10}{200}$ −8.00 = $\frac{20}{200}$; L. $\frac{10}{100}$ −8.00 = $\frac{20}{100}$. The tension was only slightly reduced. So operation was decided upon.

On November 1, 1917, with the patient under ether anæsthesia, the right eye was trephined. The iris prolapsed and vitreous presented. On November 3d there was a new prolapse of vitreous and about a week later the retina was seen to be detached. During November and December, 1917, the eye grew smaller, with ciliary injection and subnormal tension. The prolapse retracted slowly and the eye continued to shrink. In June, 1918, the operated eye showed a beginning cataract, and renewed irritation. It was enucleated July 11, 1918. Microscopic examination was not made.

The left eye, for a time, had resisted treatment with miotics; its tension remained at about 50*mm* Hg. until toward the middle of December, 1917. Its vision was then, with −12.00 − $\frac{20}{70}$. From the beginning of 1918, while the operated eye was slowly shrinking, the left eye began to improve steadily. Its tension diminished gradually from 50*mm* to 36, 27, 18, 15 and 13*mm*, until now its tension has remained, without the use of any miotics for considerably over a year, at about 13*mm* Hg. The vision of this eye has improved from $\frac{20}{70}$ (with glasses) in December, 1917, to $\frac{20}{50}$ (with −12.00), with −12.00 −1.00 axis 90° to $\frac{20}{50}$ + (on a very bright day). The patient states that her vision varies and that she does not see as well on some days as on others. The amplitude of accommodation is 5.5 diopters.

To-day (1921) her vision is not diminished; the field remains at about 10 degrees. The optic nerve shows only partial cupping (Axenfeld (19)), but is atrophic. The condition of the sclera and fundus remains the same as at the time the patient entered the Clinic. The cornea measures about 12*mm* in diameter. The aplastic (or atrophic) iris is not tremulous. In the original record there was some question as to whether or not it was tremulous, and it is still somewhat difficult to decide this point. There is a bulging forward of the pupillary portion of the iris, with retraction of the peripheric portion, as if the lens were pressed against it.

Heine (21) describes a spontaneous iris bombée without posterior synechiæ. The irides were congenitally aplastic. According to his view they were ballooned forward by an excess pressure in the posterior chamber. Similar observations by Ulbreit and Elliot are often cited in the literature. In the Heine case, only a portion of the iris in one eye, probably the aplastic portion, showed ballooning. The original record in our case mentions that the upper temporal portion of the left iris was bulging. At the present time the protrusion of the left iris is even and uniformly symmetrical.

The classification of eyes with hypertension in the young is still unsettled. The clinical picture varies and its different phenomena are understood still less than its manifestations in the adult. Megalocornea and buphthalmos can be rejected in our case, inasmuch as no corneal changes were detected; there is no excessive size of the globe in disproportion with its refraction; there is no progression, no exophthalmos. The palpebral fissure is normal in width. Hence all the typical symptoms of buphthalmos are absent.

As to the relative position of our two patients in the scale of hypertension in the young, the brother, with his somewhat larger corneæ, deep anterior chambers, tremulous irides and absence of cupping of the disk, although older than the sister, seems to lean more toward buphthalmos, while his sister, whose left eye had a narrower chamber, a smaller cornea, and early cupping of the disk, inclines more toward the glaucoma simplex form of the disease, but is still far removed from the early senile form.

In attempting to explain the cause of spontaneous reduction of tension in this case, we believe that inflammation as a causative factor, either in the production or reduction of tension, can be ruled out, for changes due to inflammation would have been permanent. Evidently the avenues for the outlet of the intraocular fluids were blocked but have in some way become free.

We may well assume that Schlemm's canal was always present and is now pervious; a similar assumption may be made as regards the other structures about the filtration angle. Instead of an arrest of development of these structures, there may have been merely a delay until after birth in their complete unfolding. A similar change may take place in other structures of the eye, for Fuchs (24) says of the pupillary membrane that it "is of comparatively frequent occurrence in the new-born infant, but *disappears afterwards*, except in a few cases in which a remnant of it persists during the whole life."

At the present time our patient and her brother both show a higher refraction than their glasses, when first seen, would indicate. The sister shows 4 diopters; her brother 1 diopter more. However, both of them have come to us undercorrected.

In our patient there was no posterior staphyloma, as is seen in higher myopia; as we have before mentioned, there was cupping of the optic disk. The cornea had not given away to the hypertension, for the anterior chamber was not deep. (It is now shallow.) The force of the pressure manifested itself in another weak area of the structures, enveloping the eyeball, by expanding the intercalary region (bluish sclera). While posterior pressure resulted in a partial destruction (atrophy) of the optic disk, the stretching of the anterior portion of the sclera probably was the means of the eye's salvation. Here some persistent embryonal bands that had blocked or strangled the normally formed outlet tubes may have given away under the increased pressure that they themselves had produced. Reiss (9), Axenfeld (4) and Treacher Collins (17) maintain similar views. Fage (7) mentions that some observers believe that such bands may be torn in some instances by the tug exerted upon them by miotics alone. It is conceivable that a combination of all the forces alluded to may have occurred.

The hypotonus of about 13*mm* Hg., now stationary for over a year, may be normal in a globe whose sclera has lost, by stretching, its power of elastic adaptability to its contents (Heine (12), Lange (13)).

If the eye of this patient is undergoing a slow process of degeneration with hypotonus (Schirmer (28) (29)) the improvement of her vision (with glasses) from $\frac{20}{70}$ to $\frac{20}{50}$ + still would be worthy of note.

In brief this is a report of a spontaneous reduction of hypertension to a state of hypotonus without diminution of vision in an eye suffering from congenital (juvenile) glaucoma. No operation was done in the eye under discussion; only miotics were given. We believe that there was an arrest of development of the structures about the filtration angle that interfered with the normal outlet of the intraocular fluids, and that this drainage system became pervious years after birth, by completion of its development (by unfolding, or by tearing any blocking or strangling impediments during this process of natural growth) or by force of the increasing tension alone. However, a slow process of degeneration with hypotonus cannot be altogether refuted.

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REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. CONRAD BERENS, Jr., Secretary.

MEETING OF MAY 16, 1921. DR. L. W. CRIGLER, CHAIRMAN.

Dr. George H. Bell showed a patient with **retinitis proliferans** in both eyes. The right eye presented a large shiny white mass in the temporal portion of the retina, from which a thin membrane passed back to the optic nerve, and was attached to it. A large number of blood vessels could be seen projecting from this mass. Both optic disks were hazy, owing to floating vitreous opacities. The patient previously had Hodgkin's disease and is now suffering from anæmia.

Discussion: Dr. Würdemann referred to the occurrence of retinitis proliferans in diabetes.

Dr. George H. Bell showed a patient with a **foreign body in globe,** of fifteen years' duration.

There is a scar on cornea and opacity in the lens. In the clear vitreous a wormlike mass can be seen above and anterior to the disk.

The X-ray reveals a foreign body in its vicinity. As the eye shows no siderosis and is quiet (vision $\frac{20}{70}$) it is advised to leave it alone.

Dr. Ben Witt Key reported a case of **tumor of the hypophysis.**

G. T., age 20, in June, 1920, began to have nausea, dizziness, and headache, and two months later developed diplopia and diminished sight in his left eye.

His family history, previous history, and physical examination were negative.

Ocular examination showed paralysis of his left external rectus, and slight dilatation and sluggishness of his left pupil. The media were clear in each eye, and in each there was a choked disk of 5 or 6 diopters, with enlargement and tortuosity of the veins, and a few small hemorrhages. A few small white patches of chorioretinitis were also present. There was no pigmentation. Vision R. $\frac{20}{30}$, L. $\frac{10}{200}$ unimproved. The fields were slightly contracted concentrically, left greater than right. The urine, blood, and spinal Wassermann were negative. X-ray (Dr. Dixon) showed frontals, ethmoids, and sphenoid cloudy. Sella 157 sq. *mm.*

A diagnosis of brain tumor was made (Dr. Elsberg) and he was given antisyphilitic treatment, under which he rapidly improved, all symptoms disappearing, and left vision improving to $\frac{20}{70}$.

January 17, 1921, X-ray showed sella enlarged to 272 sq. *mm*, with other conditions unchanged.

In spite of his improvement in other respects, there developed during this time the usual symptoms of acromegalia. He is 3¼ inches taller and weighs 45 pounds more than at the beginning of his treatment, and his features, hands, and feet are noticeably enlarged.

Upon leaving off his antisyphilitic treatment only for a short time, his original symptoms returned.

Clinically, Dr. Key regards this case as one which may be classified in the third group outlined by Dr. de Schweinitz in his recent paper (December, 1920), that of "Hypophyseal diseases in subjects in whom the history and seriological tests did not demonstrate syphilis, but in whom anti-luetic treatment was suggestive."

Dr. Key thinks his case was still more suggestive of syphilis because of the sixth nerve paralysis and chorioretinitis.

Dr. Key presented a patient with **bilateral dacryo-adenitis.**

J. B., age 16, when first examined, had inflammation of both upper lids. Onset sudden. She had had tonsillitis 3 weeks previously and gonorrhœa 3 months previously. There was no other history of importance. Examination showed marked symmetrical œdema of both upper lids; tearing, but no discharge; conjunctiva congested with œdema of Tenon's capsule in upper temporal quadrants; each lacrimal gland was enlarged, firm and tender. There was limitation of movement outward and upward, with displacement downward and inward. There was no other glandular involvement.

Physical examination was negative except a temperature of 101.5° F. and a mild urethritis when first seen. The X-ray (Dr. Dixon) showed cloudiness of all sinuses.

The condition cleared up in 10 days with rest in bed and ice and 25% argyrol locally.

Dr. Key regards this as a case of lacrimal mumps, on account of the age of the patient, bilateral involvement, absence of suppuration, and short duration.

Dr. CURTIN reported a case of **solitary tubercle of choroid,** occurring in a girl 13 years of age, with a grayish white mass adjacent to the disk with an elevation of 3 D. Vision $\frac{20}{200}$. The subcutaneous tuberculin test gave a moderate reaction and after tuberculin treatment for five months the mass is reduced in size; vision $\frac{20}{70}$, and patient has gained 15 pounds in weight.

Dr. L. W. CRIGLER presented a case of **avulsion of optic nerve.**

H. H., age 17, on March 4, 1921, while playing basketball was struck in his left eye by the finger of one of his fellow players. He was stunned for a few moments, and on recovery found that he did not see with the injured eye. Examination on the following day showed a laceration of the ocular conjunctiva in the lower-outer quadrant, a slight cut in the margin of the lower lid, evidently produced by a sharp finger nail. The pupil was dilated and did not react to light. The eyeball was soft, there was no fundus reflex, the vitreous chamber being filled with blood. He was treated at the Manhattan Eye, Ear, and Throat Hospital and the fundus reflex began to appear about the sixth day. The nerve head could be indistinctly seen as a perfectly white round disk, excavated and devoid of any visible blood vessels. A distinct laceration of the retina and choroid at the margin of the disk was evident by the sudden termination of the retinal circulation around the margin of the disk, cloudy swelling and slight pigmentation of the retina. The peripheral portion of the retina which was evidently devoid of blood immediately after the injury, and hence no longer transparent, had, by the time the fundus was visible, become transparent and the retinal circulation, by some curious means, partially restored, although there was still no blood in the main trunks internal to the laceration. The lamina cribrosa was ruptured, as evidenced by the deep excavation of the nerve head. There was a brownish black mass at the bottom of the excavation, presumably a blood clot, as it has now disappeared, and the deep cup is gradually filling in with connective tissue. There are large stream-like hemorrhages extending out into the vitreous, so that one appears to be looking at the optic nerve-head as through a funnel.

The unusual feature in this case is the fact that the avulsion was due to direct force applied to the eyeball, whereas in most cases the cause is a penetrating wound of the orbit in which the nerve is torn from the eyeball. Here we have the effect of sudden increased intraocular pressure transmitted to the head of the optic nerve, the lamina giving way, and the retinal fibers being torn from the nerve at the margin of the disk. The dural sheath of the nerve is probably intact.

The first paper was read by Dr. H. V. WÜRDEMANN of Seattle, by invitation, **the mechanism and effect of massage of the eyeball as applied in iritic synechiæ, glaucoma, embolism of the central artery, optic nerve atrophy, and retinitis pigmentosa.**

The author gives briefly his experience with massage in the treatment of embolism of the central retinal artery, the breaking up of adhesions in iritis, reduction of tension in glaucoma, optic nerve atrophy, and retinitis pigmentosa.

The author has been using ocular massage for many years, and has replaced digital massage by instrumental massage with the suction pump apparatus of the Victor machine. A rubber cup massage handle receives its power from the Victor transformer No. 2 and the Pynchon pump attachment. The nipple of the pump should be at a point two thirds distant to the right when we obtain vibrations on alternate compression and suction. The force or gentleness of the stroke is also regulated by thumb pressure over the hole in the handle. Great care should be exerted that neither the length nor the amount of the stroke causes any discomfort. In fact, the slower the stroke the better it is. We obtain the best results with 50 to

150 vibrations per minute. With the transformer and pump attachment the length of the stroke varies from 0 to 1¼ inches and the length of the stroke desired can be selected by a gauge attached to the crank pin. The rapidity of the piston stroke varies from 30 to 600 vibrations per minute. Suction and release with as long a movement of the piston as possible, in order to pull the eye in and out of its socket as far as possible, gives the best results. The suction and release are used for about one half minute, the eye looked at, and if no evidence of hemorrhage in the anterior chamber can be found, used again for about a minute, and further treatment according to the condition present.

There have never been any evil results, even when hyphæma has occurred.

DISCUSSION: Colonel HENRY SMITH said that he had no experience with this form of treatment, but believes that Dr. Würdemann has made a valuable contribution if future investigation bears out the truth of his statements.

Dr. ALEXANDER DUANE has not used mechanical, but has used digital massage in embolism of the central artery. He thought, however, that he had derived more help from the inhalation of amyl nitrate in a case of recent embolism. He is skeptical of the value of mechanical massage in retinitis pigmentosa. In neuritic atrophy he believes it might possibly help.

Dr. CLAIBORNE thought that the method described by Dr. Würdemann should be given a trial.

Dr. Würdemann in closing said he had seen beneficial results from the use of mechanical massage in 35 cases of embolism of the central retinal artery. Thirty cases of neuritic atrophy have been reported in the literature as benefited by massage. He is certain that recent posterior synechia can be broken by mechanical massage, and that massage produces permanent enlargement of the blood vessels of the eyeball.

Col. HENRY SMITH of England read the second paper of the evening, entitled **brief notes on some ophthalmological conditions** (appears on page 422 of this issue).

DISCUSSION: Dr. ARNOLD KNAPP was very much impressed with the necessity of a large section in congenital cataract to which Col. Smith had referred. In fact, in all microphthalmic eyes, it is desirable to make a definitely scleral section. Col. Smith's method of making an artificial pupil was very interesting and that the incision in the cornea must be at exactly right angles was important, so as to produce as little scar as possible. Col. Smith's method of controlling the eyelids during a cataract operation was an important contribution to the technique of cataract extraction, which has been accepted by many, even those who are not advocates of the intracapsular operation. Dr. Knapp was very much interested in hearing of Col. Smith's experiments in paralyzing the orbicularis and hoped that this method would soon be perfected. Until an anæsthetic is found which after injection will paralyze the orbicularis for one week, it will be necessary to use general anæsthesia in intractible patients and in this connection he would ask Colonel Smith to give his experience in cataract extraction under general anæsthesia.

Dr. WÜRDEMANN said that he was indebted to Col. Smith for his technique of raising the eyelid so the patient may look up during the cataract extraction. He prefers a subconjunctival incision in all eye operations. He suggested that we paralyze our patients instead of paralyzing the orbicularis. He uses $\frac{1}{100}$ of a grain of hyoscin and ¼ of a grain of morphine hypodermatically and he stated that frequently patients do not know they have been operated upon until the next day. He loses less vitreous than he did formerly although even now he confesses that he loses vitreous in 8% of extractions.

Dr. CLAIBORNE said that for years he has used Skeel's speculum, and has the assistant press down on the heel of the speculum throughout the operation. This pulls the lid forward, which is necessary, in the opinion of Col. Smith. He believes that if this method is used it will be as easy to express the lens in the capsule as by Smith's method. Dr. Claiborne said we must finally come to some method of extracting the lens in the capsule. He believed the old method was soon to become obsolete, and the extraction in the capsule was the only reasonable procedure. At the present time, however, extraction in the capsule seems to be narrowed down to two methods, the removal of the lens by the Indian method or some modification of it, and the method of suction, recently advanced by Barraquer. Dr. McDannald of this city has invented an instrument, clever and simple in its construction, for the suction operation.

Dr. MEDING said the most practical suggestion Col. Smith has given is his method of making an iridectomy, but to be successful we must follow his instructions carefully. The corneal incision must be at right angles to a line drawn through the center of the proposed pupil. It must also be without the new pupil's circumference and at least 5*mm* in length.

It is curious to hear objections against the necessity of an assistant in the cataract operation. How strange it would sound were general surgeons heard to decry any technique because it demanded the trained assistant. A very important matter in the management of the upper lid is that it be lifted forward and downward and never painfully.

Col. Smith, in closing the discussion, said he had not seen iritis adhesion in congenital cataract cases. He frequently puts patients sufficiently under chloroform to make them at ease and use cocaine to stop pain. Dr. Würdemann has made a suggestion with regard to hyoscin which may be of service, but he never uses it in general anæsthesia, for it is a dangerous drug. He does not use morphine for patients who have a tendency to vomit. He now uses bromides—120 grains for a man and 100 grains for a woman, 8 or 10 hours before the operation. The patient sleeps well for the next three nights. Sixty grains will make the patient more irritable and he assures us that the larger dose is quite safe. He went to Spain to see Dr. Barraquer operate with his instrument and he believes it is a good instrument and that Dr. Barraquer operates with it successfully. In mature senile cataract it will be successful. In Morgagnian cataract it will only remove the anterior capsule and he believes we will have to resort to his method if we wish to remove Morgagnian cataracts in capsule. He believes that the Bunsen pump will act as well as a special pump in the suction operation. Col. Smith asked, is it to the interest of the patient to do a cataract operation with just the fingers and the knife? Anyone can do this, but we never know how our patients will behave and we should be prepared for every emergency.

REPORT OF THE ANNUAL CONGRESS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

By Mr. H. DICKINSON, London.

The annual Congress of the Society was held in London on May 5th, 6th, and 7th, under the presidency of Mr. J. Herbert Fisher, F. R. C. S. The arrangements included the reading and discussion of papers, holding set debates, the delivery of the Bowman Lecture (by Mr. Treacher Collins), a clinical meeting (at St. Thomas's Hospital), a museum of exhibits and instruments and apparatus, and a dinner. It was a marked success, the attendances being well maintained at all the meetings.

President's Address: "The Personal Equation."

The President, in the course of his opening address, after expressing his appreciation of the high honor conferred on him by his election to the chair, said the complete ophthalmologist did not, indeed could not, exist. If perfection were attained, then there would be nothing more for which to strive, no further incentive to effort. The subject was wide as the heavens, deep as the ocean; to comprehend ophthalmic science as it now exists its devotees must perforce enlist as allies the mathematician, the physicist, the chemist, the physiologist, the anatomist, the physician, the surgeon, the urologist, the radiologist, the pathologist, the bacteriologist. Within the ambit of ophthalmology there was room for every man to exploit to the full the gifts and inclinations with which he had been endowed. Perimetry and the examination of the central field for color defects, absolute and relative scotomata, were playing a larger part in eye investigations, and it behooved them to remember the personal equation when employing these methods, if right value was to be attached to their results. One investigator's charts would rarely be found to coincide with those of another on the same subject being examined. Only when a surgeon had stereotyped his own personal equation and controlled that of his patient would his results on the same case on successive dates be reliable for clinical purposes. Tonometry was tending to replace digital estimation of intraocular pressure, and it was for the younger ophthalmologists to explore its value. Not yet, however, would it quench the older method. Every means should be taken to keep clear of error. The indication for or against operation in a case of chronic glaucoma would never be determined by such variables as the readings on a tonometer, or the shape or fluctuations of the blind spot, though these observations should be a useful supplement to the well-trained clinician. In ophthalmology, the symptoms narrated by the patient were ambiguous, the chief signs were precise. Too often the ophthalmologist was confronted with the highly myopic sempstress or clerk, incapacitated in the later years of working life by failing vision. A little guidance given to the progressive myope about to embark on the serious business of life—a suggestion as to suitable employment—might save such an one from a life of misery, ending in shipwreck. Compared with such help, the most perfect retinoscopy was of little value. In no other organ of the body than the eye was it given to the clinician to view the pathological process in actual progress, and the ophthalmologist was proud to be called in by his colleagues to clinch, by his objective methods, the suspicions of grave local or general disorder. He could give much help to the neurologist in cases of hemianopia by the presence or absence of Wernicke's sign or pupillary reaction.

He proceeded to advocate a closer working coöperation with colleagues in general medicine and surgery; the gain would be mutual. But the ophthalmologist must keep his own house in order. The pupil must be taught to realize that in dealing with his patients he had responsibilities which he could transfer to no one else. Laboratory investigations might supplement his own work, but they were no substitute for it, and he must be trained to stand erect by himself. The study of disease in the eye could be undertaken only by those who had been trained in every branch of medicine and surgery: on this there could be no compromise. Ametropia and its results could not be surrendered to the optician. Physiological working, not visual acuity, was the goal of the refractionist. $\frac{6}{6}$ vision was not proof that the most serious—or indeed any—disease of the eye was not present. Mr. Fisher concluded with a sympathetic appreciation of the work of two recently deceased members of the Society, Mr. Charles Higgens, and Mr. H. E. Juler.

On the motion of Sir ANDERSON CRITCHETT, the President was cordially thanked for his address.

Mr. MAITLAND RAMSAY (Glasgow) read a paper on a case of **cyclitis associated with swelling of the parotid glands, and paralysis of cranial nerves.** The patient, an unmarried lady of 31, had had enlarged cervical glands removed at 6 years of age. After family trouble and hard work she awoke one morning with her lower eyelids puffy and her ankles swollen. No abnormality was discovered in the urinary, circulatory, respiratory, or digestive systems. Swelling increased, and extended to the knees, and the skin of the chest was hyperæsthetic, accompanied with intercostal pain. After ten days in bed the œdema of ankles disappeared, but not the intercostal pain. Even large doses of aspirin only gave temporary relief. In the third week the left parotid gland began to enlarge, and the right a week later. A fortnight later the sight of the right eye became dim, and a similar condition came on in its fellow five days later; the eyes readily watered on exposure to light. The sight became very dim, and there was pericorneal injection with numerous spots on the posterior surface of the cornea, discoloration of the iris, irregularity of pupil, and a deep anterior chamber, but the intraocular tension was not increased. The visual acuity was, R. $\frac{6}{12}$, L. $\frac{6}{18}$. A week or two later there was sudden paralysis of the left facial nerve. Failure of vision was now rapid, and in a few days she could scarcely distinguish a hand held between her eyes, and she had a throat condition which interfered with swallowing; the soft palate was seen to be paralyzed. At this stage improvement set in, coincidently with the administration of thyroid extract, on the assumption that the condition was a deficiency disease. She got well. Neither mumps nor diphtheria could be considered as causal factors.

Mr. J. Gray Clegg (Manchester) read a paper on **partial monocular lamellar cataract associated with persistent pupillary membrane and birth injury.** Dr. Gordon Renwick cooperated with him. He showed and demonstrated the slides by the epidiascope, and raised the question whether the birth injury had anything to do with the association of partial lamellar cataract with persistent pupillary membrane. He referred to Treacher Collins's work on the subject.

Mr. G. F. Alexander read two papers. The first was on the **influence of age on the power of the crystalline lens.** He said the prevailing teaching inferred that in the lens there were surfaces acting as concave refracting surfaces, and that the increase in the index of the cortex was, by increasing their power, the cause of the diminution of the power of the lens as age advanced. The author, however, contended that there are no such surfaces in the lens. In regard to refraction, a spherical surface separating two media of different index was convex if its center is on the side of the one of greater index, and concave if it is on the side of the one with less index. And as in the lens and its nucleus the more central the lamellæ were the higher were their indices, the center of their curvature must lie on the side of the medium of greater index. Hence the surface separating the cortex and nucleus is a convex and not a concave one; and a ray incident on either surface of the lens encounters in its transit through it a series of convex refracting surfaces, and at no part of its surface a concave one. He contended, secondly, that the cause of the diminution of the power of the lens as age advances is the diminution in the convexity of its surfaces and those of the nucleus from their growth. He showed that the radius of the surface of the lens is greater than that of the surface of the nucleus. The only factor tending to diminish the power of the lens as age advances is the increase in the radii of its surface and those of the nucleus accompanying their growth.

Mr. Alexander read a paper also on the **estimation of torsion or near vision.**

A Court Quack.

Mr. R. Rutson James read a paper entitled **Sir William Read, Oculist to Queen Anne and to George I: Quack, Mountebank.** It was an exposure of extravagant claims to medical and surgical skill on the slenderest foundation, and a narration of the material success achieved.

Mr. D. J. Wood (of Cape Town) sent two papers, which were read. The first was entitled **two cases of flat neoplasm of the choroid.** The first of the patients, a man aged 27, complained that during the last six weeks he had lost the sight of his left eye. There was a widely dilated pupil, unusual redness of the outer part of the sclerotic, and a detachment of retina close to the back of the lens. A colleague had discovered disease in the left antrum and in the back part of the lower jaw. Glands on the right side of the neck were enlarged. A portion of one which was taken away was supposed to be epitheliomatous. X-rays produced improvement. It was evident, however, that there was an intraocular tumor, as the iris began to bulge forward on the outer side. The eye was therefore excised, and there was found a typical flat sarcoma extending from the optic nerve forward to the iris, with complete detachment of retina. The growth was everywhere in contact with the sclerotic, and infiltrated it; and it extended up to, without involving, the optic nerve.

The second patient was a Jew, aged 40, whose left eye was glaucomatous. The eye was blind, the cornea steamy, the pupil dilated, and there was an area of redness on the outer part of the sclerotic. The eye was excised. The tumor occupied the whole of the lower half of the fundus, and was a flat growth with a complete retinal detachment. It had begun close to the optic nerve, and extended forward to about the ora serrata. It was spindle-celled. Mr. Treacher Collins had examined the specimen, and considered it was of the epithelial type, the cells being arranged in alveolar fashion; he thought it was probably a secondary carcinoma of the choroid. A section from the glands in the neck showed an epitheliomatous growth.

Mr. Wood also sent a paper on a case of **symmetrical encroachment of the conjunctivæ on the corneal margins.** The patient, a somewhat old man, had been treated for cellulitis at the root of the nose, and pus was evacuated from the lids of the eye. The corneal margin was found to be covered by a ring of conjunctiva from 2 to 2½*mm* wide, and the conjunctival vessels were continued into it. With a fine probe the conjunctiva could be separated from the cornea.

The Psychology of Vision in Health and Disease.

Thursday afternoon was reserved to a discussion on this subject.

Professor C. Spearman, Ph.D., introduced the debate. He said we see objects in different places, and the question of the source of this power was one of the most difficult in psychology. Generally, the authorities had been divided into two antagonistic camps. The first consisted of the empiricists, who regarded visual place as the outcome of experience, arising through some such process as "association" or "fusion." On the other side were the "nativists," for the most part physiologists such as Galen and Johannes Müller, who maintained that the power was essentially innate. According to them, the apparent situation of any particle was "specific energy" of the particular nerve fiber stimulated. This camp had also brought forward a strong array of evidence, and claimed that pathological cases favored their view. There was no longer reasonable doubt that our spatial perception was, at any rate partly, determined by factors of a hereditary character. If the origin was to be sought in experience, it must be in some degree that of our ancestors. Wheatstone made a serious breach in the extreme nativist theory when he showed that the pair of images thrown on the two retinæ by any visible particle did not, in general, fall on "corresponding" points of the retinæ; it was, in fact, their very deviation from "correspondence" that furnished our chief criterion of distance and depth. A pair of images, he showed, though thus falling on non-corresponding points, could, nevertheless, be seen as a single image. Straub concluded that the binocular perception of distance must be merely derivative from the far older uniocular perception of it. Professor Spearman showed that two retinal points, although truly "corresponding" and normally producing the same visual situation, engendered, under certain circumstances, different visual situations; in fact the spectacle might be presented of an object moving backwards and forwards although, all the time, the place of retinal stimulation remained unchanged. He leaned still more to the empiricist school than to the nativist.

Mr. J. H. PARSONS, F. R. S., read an exhaustive paper on the **evolution of visual perceptions, with special reference to the rôle of suppression.** It is difficult to give an adequate idea of the contribution in a short précis. He was followed by Sir ROBERT ARMSTRONG-JONES, the psychologist, who spoke of an acute melancholiac being restored to mental health by having her refractive error relieved by glasses. He referred also to the relief produced on mental patients by appropriate color-schemes.

Dr. S. A. KINNIER WILSON read a paper on **psychological peculiarities in certain visual auras in epilepsy.** He related cases of idiopathic epilepsy which were distinguished by a mental state presenting curious psychological characteristics of its own. He recalled that Dr. Hughlings Jackson had directed attention to this condition, and used several terms to describe the occurrences, one of which was a "voluminous mental state." Dr. Wilson said there were two distinct types which should interest the ophthalmologist. The first was the *déjà vu*, or the "familiarity" type, and its converse the strangeness type (in which surroundings and conditions either seemed very familiar or unaccountably strange); and the second was the "visual memory" type. He gave examples of both from his own experience.

Dr. A. S. PERCIVAL said a sensory impulse may not affect consciousness, and yet a coördinated movement in response to that stimulus may result. The psychology of vision really meant, he said, an enquiry as to how a physical or chemical change in certain nerve cells could give rise to a consciousness or sensation of light.

Mr. FRANK JULER read a paper entitled **amblyopia from disuse: visual acuity after traumatic cataract in children.** He said he had thought that more light might be thrown on this subject by evidence which gave more exact definition or determination of dates of onset than was obtained from ordinary strabismus cases. He thought that in certain cases of injury to the lens in young children a line of evidence might be obtained which would satisfy the disputators, and perhaps decide whether amblyopia from disuse exists or not. In most cases of traumatic cataract, he said, the opacity was rapid, and little light reached the retina after the injury. In some of his cases the lens matter had been evacuated soon afterwards, leaving only an opaque membrane, while in a few an artificial pupil had been made not much later. Even in cases where an artificial pupil had been made, the deviation of images by the aphakic hypermetropia must be so great that the retinal impulses could not compete with or assist those transmitted from the retina of the sound eye, and one would expect these impulses to be neglected, with the consequent development of amblyopia from disuse, if such disease exists. The latter should still more certainly develop if an opaque lens or membrane blocked the light path for some considerable period. He had been able to trace a certain number of the juvenile traumatic cataracts recorded in the Moorfields Hospital notes from 1910–17, to see them personally, in many cases to form a new pupil, and finally himself examine the vision, fundus, and other points in every case quoted. He found a striking line of difference between the final visual results, depending on the age at which the lens became opaque. None of the eyes which became cataractous before the age of 5 had retained a final central acuity of vision of $\frac{6}{60}$. The series gave evidence that there is such a disease as amblyopia from disuse; that it affected the eyes of children up to 6 years, that it did not attack eyes after the age of 7 years, that it was not merely a standing still of the development of the retina or certain cerebral associations, but that it caused a real retrogression of the effective power of the retinal impulse on the consciousness after the macula had reached an age at which a central vision of $\frac{6}{6}$ was normally present. The existence of amblyopia from disuse as the result of concomitant squint had been the subject of dispute among ophthalmologists for the last fifty years.

Mr. E. TREACHER COLLINS then delivered the Bowman Lecture, taking as his subject **"changes in the visual organs correlated with the adoption of arboreal life and the assumption of the erect posture."** He was cordially thanked for the lecture.

Friday morning was devoted to a discussion on **the treatment of manifest concomitant strabismus.**

Mr. Claud Worth, in opening the debate, said the matters to be considered in the treatment of convergent squint were: (1) the prevention or cure of amblyopia ex anopsia; (2) the correction of refractive error; (3) fusion training, and (4) operation. If a constant unilateral squint had lasted a considerable proportion of the child's life, in the absence of efficient treatment the deviating eye would be found to be more or less blind. Probably no one now doubted that the amblyopia was almost invariably acquired from disuse; and the loss of sight was more rapid the younger the child. One who began to squint constantly at the age of one year might lose central fixation in three to four months. The child must be forced to use the deviating eye; that was far more important than all the rest of the treatment of squint. In a recent squint, to cure low degrees of amblyopia, or prevent it, the fixing eye should be kept under atropine until it became the deviating eye. The child should then be seen again after the effect of the atropine had passed off. After this, the deviation must be kept alternating, one or other eye being atropinized occasionally if necessary. If central fixation in the deviating eye was absent or unsteady, the atropine treatment was not sufficient. Then the fixing eye should be continuously occluded; intermittent bandaging was of little use.

With regard to correction of refractive error, no child was too young to wear glasses if they were required. As to fusion training, there were certain principles which must apply to all methods. The child must be young, preferably under 6 years of age, and the sight of the deviating eye must be good. A device should be used for throwing pictures simultaneously upon the macular region of each eye. The most difficult step was to overcome the suppression. A good way was by unequal illumination of the object slides in whatever instrument was being used, and the interest of the patient must be maintained during each lesson. The object of fusion training was not to correct the deviation, except in small degrees, but to enable the patient to see binocularly when the visual axes shall have been restored to approximately their normal relative directions.

With regard to operation, if measurements showed that the angle of deviation was increasing or was not decreasing operation became necessary. If there was no hope of binocular vision, he did not, usually, operate until the 7th or 8th year of age. Formerly, he frequently performed tenotomy of the internal rectus in combination with advancement of the externus in high degrees of convergent squint, but this practice was finally abandoned by him in 1905. Many of these cases had been followed by divergence long afterwards. For many years he had been relying on advancement alone, and, except in very small deviations, both externi were advanced. He proceeded to enter into the minutiæ of technique, concluding with the remark that there were practically unavoidable failures in squint operations; the result attained was a measure of the skill and experience of the surgeon, who should be prepared to accept the responsibility for it.

Mr. A. J. BALLANTYNE made a contribution in which he dealt with his own experience of concomitant convergent squint. In every case the first procedure should be an estimation of the refraction and the prescription of suitable glasses for constant wear. If there was merely a low degree of hypermetropic astigmatism, one would not expect glasses to influence the squint, and the wearing of glasses would be postponed until 2 years of age. In many the wearing of glasses, with training if necessary, was all that was needed. Practically all his cases were aged 7 years or under, and the largest squint he had corrected was 40°, the patient being 18 months old, and the squint of two weeks' duration; in most of the cases the angle was 15° or less. If one eye was amblyopic, an attempt should be made to train it. In most cases, he thought, the amblyopia was the result of the squint. He applied atropine more or less continuously to the sound eye. He was inclined now to operate at an earlier age than formerly was thought desirable. Advancement alone sufficed in many cases; he had never seen permanent over-correction result from advancement or muscle-folding, therefore he would not hesitate to operate at any age. Worth's operation could be depended on to correct 20° or 25° of convergence. The muscle-folding operation gave about half this effect. He rarely did tenotomy of the internal rectus, and he objected to combining tenotomy with advancement at one operation in a patient under 16 years. If tenotomy were done in children, it should be of the nature of a last resort. Strabismus operations might be very disappointing in excitable and nervous children. Failure in operation was in some cases due not to slipping of the stitches, but to looking to a remedy of a mechanical kind for an error which was functional. His results from amblyoscopic fusion training had been disappointing. The varied pathogenesis of concomitant strabismus made it evident that the same treatment would not be suitable in every case.

Mr. M. S. MAYOU said that if a patient had good vision in both eyes and there was some attempt at fusion, he operated as early as possible, provided the patient had worn glasses a year without improvement. For convergent strabismus up to 15° he did tenotomy of the internal rectus, but in young children as much as 20° could sometimes be corrected by it. For convergent squints of 15° to 45° he did a tenectomy associated with tenotomy; he preferred a shortening of the tendon and using the stump of the muscle attached to the globe for holding the sutures.

Mr. N. BISHOP HARMAN said the factors responsible for squint could be grouped under three heads: (1) defects of the eyes; (2) defects of the muscles; (3) toxic influences, in the widest meaning of that term. Among 368 infants in a higher grade school, only 8 had emmetropic eyes, many had errors of refraction, mainly hypermetropia, and in 126 the errors were of considerable or even high degree. Yet among all those children there were only 8 squinters. The most influential factor in squint he considered to be defective balance of the muscles. His favorite method of operating was shortening of one muscle by subconjunctival reefing with lengthening of the antagonist by tenoplasty.

At the evening meeting the following papers were read:

Lieut.-Col. H. HERBERT: **a justification of the wide iris-prolapse operation for glaucoma.**

Mr. T. HARRISON BUTLER: **on the rational treatment of glaucoma.**

Mr. C. GOULDEN and Mr. M. H. WHITING: **implantation cyst of the sclera following an operation for squint.**

Sir WILLIAM LISTER: (a) **some intraocular epithelial cysts;** (b) **punctate deposits in the retina.**

Mr. P. G. Doyne: **some observations with the scotometer.**

On Saturday morning there were further papers, as under:

Sir Arnold Lawson: **a case of orbital tumor (neuroma).**

Mr. Harold Grimsdale: **a note on the mechanism of the equilibrium of the globe.**

Mr. E. H. Stack and Dr. George Mackay exhibited motor trephines, and Mr. A. W. Ormond read a paper on **extraction of cataract by suction.**

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. H. Dickinson, London.

A clinical meeting of the Section was held on June 10th, with Mr. W. T. Holmes Spicer occupying the chair.

A Speculum to Prevent Pressure on Globe.

Dr. Wallace Henry demonstrated a speculum which he had devised for the purpose of preventing a patient pressing his eyelids together after an opening had been made surgically. He said that since he started using it, at the beginning of the year, he had had no loss of vitreous. He was accustomed to leave the speculum in position until the lens extraction and the toilet was finished.

It had a favorable reception.

A Desk for Myopic Children.

Mr. Frank Moxon showed a desk for use with myopic children or those who, on account of the close application of the eyes to the task in hand, were liable to become myopic. The eyes were kept at a minimum distance by means of plate glass, under which the child did his writing.

Cases of Macular Disease.

A number of cases of macular disease were shown and discussed: Mr. Rayner D. Batten: Two cases of acute macular disease; Mr. McMullen: Changes in the fundi in three brothers; Mr. G. W. Roll: Case showing macular changes.

Mr. Batten spoke of the desirability of a better knowledge of diseases of the macula; cases frequently occurred in which macular changes were the only evidence of disease and the cause of failure of sight, unassociated with other forms of retinitis. There was a great discrepancy between the physical signs, as shown by the ophthalmoscope, and the symptoms. Much depended, for a recognition of the physical changes in the macula, on the light. When a really efficient light was available, fine pigment changes which now escaped observation would be detected. Finer changes in the macula could be better seen by looking to one side rather than straight at the macula. The two acute cases he now showed were not unlike the family group in respect to the fundus changes; this familial group must be kept in view in investigating macular changes, otherwise the explanation of the fundus change might be missed. Familial amaurotic idiocy was allied to that which was racial in origin, and both forms might be due to the same toxin. The nature of the toxin was not yet known; in his cases causes at work included pyorrhœa, suppuration of nasal sinuses, gonorrhœa, influenza, and other illnesses, and pregnancy.

Mr. McMullen's three brother cases all had fundus changes of different character, but having one feature in common, viz., the development of abnormal connective tissue, either on the surface of the retina or the vitreous. Of the possible causes, he favored the view that they followed intraocular hemorrhages. He regarded the cases, in fact, as atypical retinitis proliferans. These three brothers were members of a family of 13 children—9 boys, 4 girls. Three of the boys died early in life, i.e., between 2½ and 5 years of age, and of the 6 surviving boys 4 had defective sight.

Mr. Roll's case had a circular plaque of what seemed to be organized fibrous tissue of the macula, the changes being symmetrical in each eye. Sight failure had been complained of 7 years, especially during the last two years. The field of vision for white and red was practically normal, but yellow and green were scarcely perceived at all. The only history which at all pointed to traumatism was proximity to a falling bomb. The appearance was not unlike that in the Tay-Sachs cases, though these latter were confined to infants, and to the Jewish race. In one eye there was a hole through the plaque of fibrous tissue.

Mr. HERBERT FISHER, discussing the foregoing cases, thought such a mass of organized fibrous tissue could only have been produced by some lesion, presumably toxic, of an irritative character. He did not know whether there was antecedent hemorrhage. He did not think there was a resemblance to the Tay-Sachs disease in Mr. Roll's case. He agreed with Mr. McMullen's view of the cases that gentleman showed. The macula might show an extreme vulnerability to toxic causes, and in some of the cases there might be macular change having such an origin without peripheral change, though in some there was choroidoretinitis.

Mr. R. R. CRUISE mentioned a case similar to Mr. Roll's, which had been under his observation ten years. The condition began with a quiet-looking œdema of the macula, and went on to a state very similar to that in the present case. The sight was less than $\frac{6}{10}$, and a similar process developed in the other eye. There was first a slight stippling of the macula, then œdema, and later a pale-looking area developed, and that was now quite pigmented over. If first seen now it would give the impression of owning a hæmatogenous origin. He believed cicatrization had now set in. There was some likelihood of the patient being tuberculous; there was no more definite toxic history. He had had two similar cases in private practice since the war, and from them Mr. Matthews obtained the dysentery bacillus and the para-typhoid. They improved very much on treatment with vaccine.

Miss MANN showed an atrophic iris in a patient, the affected area being a sector which went up and out and down and in. At 3 weeks of age the child had smallpox, and blindness had existed in that eye as long as could be remembered.

Mr. J. H. PARSONS, F. R. S., commented on the occasional absence of uveal pigment from the iris which was not revealed by ordinary examinations, hence it might occur more frequently than was usually supposed.

Mr. M. S. MAYOU showed a patient with an unusually large cyst of Moll's gland.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by Drs. A. N. ALLING, New Haven; M. J. SCHOENBERG, New York; T. H. BUTLER, London; P. J. DOYNE, London; and K. WESSELY (*Archiv für Augenheilkunde*), Würzburg.

Edited by MATTHIAS LANCKTON FOSTER, M. D., F. A. C. S.,
New Rochelle, N. Y.

(*Continued from July number.*)

XI.—THE PUPILS.

108. BOTTERI. **A case of polycoria.** *Klin. Monatsbl. f. Augenh.*, lxiv.
109. DUJARDIN, B. and RASQUIN, E. **Syphilis and irregularity of the pupils.** *Annales d'oculistique*, clvi., 2.
110. FLEISCHER, B. and NIENHOLD, E. **Traumatic reflex immobility of the pupils.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv.
111. LANDOLT, M. **Suggestions on the methodical examination of the pupils.** *American Journal of Ophthalmology*, February, 1920.
112. WODAK. **A vestibular reflex of the pupils.** *Muenchener med. Wochenschrift*, 1920, 1.

BOTTERI (108, **Polycoria**) reports a case of bilateral polycoria met with in a man 26 years old, who had dolichocephalus, but no other abnormalities. There were two pupillary apertures in the right iris, three in the left.

DUJARDIN and RASQUIN (109, **Syphilis and irregularity of the pupils**) have made clinical and serological examinations of 265 patients with irregular pupils and found syphilis present in 70 per cent. In some of these patients the irregular pupil was the only manifestation of syphilis.

SCHOENBERG.

FLEISCHER and NIENHOLD (110, **Traumatic reflex immobility of the pupils**) report a case of incomplete, absolute, monolateral immobility of the pupil, characterized by almost complete absence of the direct reaction to light, better preservation of the consensual, and simultaneous impairment of the accommodation, met with in a child 4 years old who had been struck by a fork in the lower lid. They have not been able to find that a single case of bilateral reflex immobility of the pupils as caused by trauma has been published which corresponds exactly with that produced by tabes or paralysis.

LANDOLT (111, **Methodical examination of the pupils**) emphasizes the importance of a more exact study of the pupil. He makes his examinations under uniform conditions using a frosted light which can be placed at varying distances from the eye. He employs grafts to record the observations made under the varying condition and at different times. He predicts many interesting and new results which are to be expected from a wide application of these methods.

ALLING.

WODAK (112, **Vestibular reflex of the pupils**) observed during the caloric and rotatory testing of the vestibular apparatus a distinct dilatation of the pupils, which lasted from one to thirty seconds. He found this in 170 persons with normal ears, in deaf mutes, in dementia præcox, and in persons with pupils immobile to light. He claims that it has never before been described, and gives it the name of vestibular pupillary reflex. It is caused, in his opinion, by irritation of the sympathetic.

XII.—THE UVEAL TRACT AND SYMPATHETIC OPHTHALMIA.

113. CONNER, A. B. **Congenital choroideremia.** *American Journal of Ophthalmology*, August, 1919.

114. COOKE, C. T. **Rôle of focal infection in sympathetic ophthalmia.** *Ibid.*, January, 1920.

115. DENNIS, D. N. **Apparent sympathetic ophthalmia nine months after enucleation with implantation of gold ball in Tenon's capsule.** *Ibid.*, July, 1920.

116. DOR, L. **A case of sympathetic ophthalmia cured without enucleation.** *La clinique ophtalmologique*, viii., 1.

117. FUCHS, E. **Superficial proliferation of the ciliary epithelium, with remarks concerning ectopia of the lens.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., 1920.

118. GINSBERG. **Chronic iridocyclitis with true lymph follicles in the ciliary body and iris.** *Ibid.*, lxiv., 1920.

119. GOULDEN. **The treatment of prolapse of the iris following acci-**

dental wounds, with a note on removal of non-magnetic foreign bodies from the anterior chamber. *British Journal of Ophthalmology*, May, 1920.

120. JACKSON, EDWARD. **Pseudotumors of the uveal tract.** *American Journal of Ophthalmology*, June, 1920.

121. KNAPP, A. **The autotoxic factor in sympathetic ophthalmia.** *Journal A. M. A.*, June 28, 1919.

122. LEMBERG. **Uveal sarcoma.** *Inaug. Diss.*, Giessen, 1919.

123. LINDNER. **A peculiar case of metastatic ophthalmia, with remarks concerning striated corneal opacities.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., p. 217.

124. VELHAGEN. **Two choroidal sarcomas in one eyeball.** *Ibid.*, lxiv., p. 252.

An 11 year old boy with congenital myopia and ectopia of the lens in the right eye, and congenital myopia in an enlarged left eye, was struck in his left eye by a stone, and later by a fist. FUCHS (117, **Superficial proliferation of the ciliary epithelium, with remarks concerning ectopia of the lens**) found the lens luxated, the retina detached, and a proliferation of the ciliary epithelium from the end of a piece of the detached retina connected with the pars ciliaris. This newly formed epithelium lay on the surface of the vitreous and enveloped the lens, lying directly on the capsule. It was deeply pigmented. In the pathogenesis both of the injuries and the congenital conditions have to be taken into account.

GINSBERG (118, **Chronic iridocyclitis with true lymph follicles in the ciliary body and iris**) found in the eye of an elderly syphilitic a chronic iridocyclitis without caseation, gumma formation, giant cells, or special vascularity. In the ciliary body he found typical lymph follicles with well-formed germinal centers. Hitherto these have been found in only a few cases in organs which contain no adenoid tissue, and not before in the eye. This finding proves at any rate that it is not necessary for adenoid tissue to preëxist in order to have formed nodules of lymphocytes with germinal centers.

From a large experience of such injuries, acquired in France during the war, GOULDEN (119, **The treatment of prolapse of the iris following accidental wounds with a note on the removal of non-magnetic foreign bodies from the anterior chamber**) has some interesting observations to make as regards their treatment. He does not recommend that any attempt should be made to replace the iris prolapse on account of the probable introduction of sepsis and on account of extreme likelihood of a recurrence of the prolapse.

He lays great stress on the importance of not only removing the piece of prolapsed iris but of thoroughly removing all uveal tissue from the wound. In tangential wounds of the cornea he points out the difficulty often experienced in clearing the wound of uveal tissue, especially that portion of the iris which lies under the lower lip of the valve-shaped wound. He advises that a small keratome incision, 3 millimeters within the limbus, should be made on the side of the cornea opposite to the wound; that the prolapse should then be dealt with; and that finally a repositor should be entered by the original keratome incision and by this means the wound will be more easily cleared of iris tissue.

In wounds involving the cornea and sclera he advises that the conjunctiva should be dissected up freely in all directions from the wound and after dealing with any prolapsed tissue should be sutured securely over the wound; he does not advise scleral sutures.

He is a strong advocate of a conjunctival covering to all wounds where practical, and prefers that the conjunctiva should be freed at the limbus and if necessary undercut and then gathered up with a pursestring suture or by sutures passing over the cornea to the opposite side.

With regard to those cases in which a non-magnetic foreign body is situated in the angle of the anterior chamber, difficulty may be experienced in reaching the foreign body owing to the fact that the incision at the limbus is not on the same plane as the iris and consequently the points of the forceps cannot be sufficiently depressed to grasp the foreign body securely.

In these cases he advises that a keratome incision be made in the cornea halfway between the center and the limbus in the quadrant of the cornea lying over the foreign body and that the point of the keratome be directed towards the foreign body. By this procedure the foreign body can be easily seized in forceps and withdrawn and the risk of prolapsed iris avoided.

P. G. Doyne.

Conner (113, **Congenital choroideremia**) in examining the eyes of a soldier who had, all his life, suffered from night blindness found the choroid entirely absent in both eyes except for a small circular area about twice the size of the disk, in the macular region. The fields of vision were markedly contracted for form as well as for colors.

ALLING.

LINDNER (123, **Metastatic ophthalmia**) saw a peculiar case of metastatic ophthalmia which presented clinically with no signs of irritation a deep, striated corneal opacity. The stiæ were straight, thick, some radiating, some crossing. Examination of the eye removed after death revealed streptococci in a network of marginal loops in the episcleral tissue, in the anterior ciliary veins, and in Schlemm's canal, whence they extended in thin lines between the most posterior lamellæ of the cornea to its center. From the filtration angle they extended into the ciliary muscle, along the posterior surface of the cornea, throughout the iris, and then backwards to the surface of the ciliary body. They also occupied almost the entire suprachoroideal space, whence they passed along a nerve into Tenon's space. The vascular system of the choroid and retina was completely free from germs, as was the vitreous, except for a few in its anterior part. There were scarcely any inflammatory symptoms, but there was necrosis of the cornea, of the inner layers of the sclera, except for a small zone free from bacteria about the optic nerve, of the iris, of the superficial portion of the ciliary body, of the outer and middle layers of the choroid, and of small areas in various places. There was no hypopyon because the vessels of the iris were thrombosed. He considers that the striation of the cornea is not to be considered as due to a folding of its posterior limiting membrane, or to fissures of the endothelium, but probably to a purely optical change of the corneal tissue caused by the entrance of a changed aqueous.

LEMBERG (122, **Uveal sarcoma**) analyzes 31 cases of uveal sarcoma which have been observed during the last 30 years in the Giessen clinic. He finds that the affection was almost without exception unilateral, and that it occurs most often in elderly people, reaching its high point in the seventh decade. Of these thirty-one sarcomas, twenty-eight were situated in the choroid, two in the ciliary body, and one in the iris. In five there was a history of injury at some previous time. The only treatment was removal of the eye. Of twenty-five cases, in which the operations date back more than five years, four have died from unknown diseases, ten have lived more than five years without recurrence and are well, and six have died, one of a tumor of the liver seven years after operation, and one of cancer of the stomach eleven years after. Of the more recent cases one is dead of metastasis in the liver, three are well, and the rest have passed from under observation. Of fourteen cases operated on in the first stage, five are well, another is well at the end of four years, one died from metastasis, two are dead from unknown causes, and nothing is known of the other five. The results in the second stage of the disease are not so good, and in the third stage are still worse.

VELHAGEN (124, **Two choroidal sarcomas in one eye**) found a pigmented round-celled sarcoma at the posterior pole, and a less pigmented spindle-celled one in the equatorial region. They were 5 or 6*mm* apart and the intermediate tissue showed inflammatory changes. He thinks the spindle-celled sarcoma was a metastasis, as the round-celled had the simple construction.

JACKSON (120, **Pseudotumors of the uveal tract**) relates two cases in which the diagnosis of intraocular tumor was in doubt. The eye of a boy of 13 showed a grayish white sharply defined mass projecting into the vitreous from the ciliary region. Questionable transillumination, the presence of synechiæ and the history of an attack of inflammation, pointed rather to uveitis. A year later the mass had become white and shrunken. The other case was a man of 59 who showed in the region of the macula a circular elevated area twice the size of the optic disk. He was given KI and the lesion did not increase in size. Six years later the patient reported that the vision had recently failed.

ALLING.

DENNIS (115, **Apparent sympathetic ophthalmia nine months after enucleation with implantation of gold ball in Tenon's capsule**) removed an eye lost through inflammation following injury by a piece of steel which was extracted with a magnet. At the time the other eye was free from irritation with vision $\frac{20}{10}$.

He implanted a gold ball. Eight months later the patient returned with reduced vision, pericorneal injection, Descemitis, loss of accommodation and slightly elevated tension. Under treatment he recovered but there were two recurrences about a year apart. Since that time (three years) the patient has been free from trouble.

ALLING.

COOKE (114, **Focal infection in sympathetic ophthalmia**) believes that sympathetic ophthalmia is an anaphylactic inflammation. A focal infection such as an apical abscess furnishes the larger doses necessary for anaphylaxis, the eye being already sensitized. With this in mind he urges that a thorough search be made for focal infections in these cases. He relates cases in which infected teeth were discovered and which seem to bear out his contentions.

ALLING.

DOR (116, **A case of sympathetic ophthalmia cured without enucleation**) relates the case of a wounded soldier, who refused to permit enucleation of the injured eye, was treated with atropine, salicylates, and intravenous injections of mercury and recovered with a vision of ⅕ R. and ⅔ L.

SCHOENBERG.

Attention has been called to the fact that cases of this disease are often the subjects of constitutional disturbances and it has been suggested that it is an anaphylactic phenomenon. KNAPP (121, **The autotoxic factor in sympathetic ophthalmia**) relates four cases tending to show that toxæmia is associated with the condition. They belonged to the type characterized by a serous iridocyclitis in distinction from the plastic form which is of a more serious nature. There was in the second eye moderate ciliary congestion, posterior corneal opacities, neuroretinitis as well as the macular changes and small choroidal spots at the periphery described by Haab. The treatment was eliminative with subconjunctival injections of salt solution. Two of the eyes causing the sympathy were enucleated and examined. They showed the typical sympathetic infiltration.

ALLING.

XIII.—THE LENS.

125. ASCHER, KARL W. **Smith's extraction of senile cataract in its capsule.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., 1920.

126. BARRAQUER, I. **Phakerisis.** *Amer. Jour. of Ophthalm.*, October, 1920.

127. Bennett, A. G. **Immediate capsulotomy in the extraction of senile cataract.** *Ibid.*, December, 1919.
128. Gonzales, J. de J. **Spontaneous rupture of Morgagnian cataract.** *Ibid.*, October, 1919.
129. François. **Immediate discission of the posterior capsule in cataract extraction.** *La clinique ophtalmologique*, viii., 5.
130. Terson, A. **Remarks on preliminary iridectomy and cataract extraction in diabetics.** *Annales d'oculistique*, clvi., 3.
131. Ziegler, S. L. **Adventitious membrane following operation for secondary cataract.** *American Journal of Ophthalmology*, April, 1920.

Ascher (125, **Smith's extraction**) reports the results obtained by Elschnig in 129 operations of this nature, and comes to the conclusion that this procedure is not fitted for European conditions. The advantages claimed are no secondary operation, better vision, no postoperative inflammation, shorter postoperative treatment, and operability of unripe cataracts. The main disadvantage is the danger of loss of vitreous. The results in this series of cases showed no shortening of the convalescence, and no better visual results than after extraction from the capsule.

Barraquer (126, **Phakerisis**) describes the suction apparatus which he has devised for the extraction of cataract. The tip is introduced after the corneal section either with or without iridectomy and applied to the anterior capsule where it adheres. By tilting the lens it is brought out through the pupil and wound. He has operated upon 1000 cases by this method. Alling.

Bennett (127, **Immediate capsulotomy in the extraction of senile cataract**) recommends that capsulotomy be done by the point of a knife as it passes through the anterior chamber. The point should not be thrust deeply into the lens but just under the capsule, the pupil being widely dilated with atropine before the operation. He does the simple extraction. The advantages are that only one instrument is introduced and a wide opening in the capsule is usually insured giving a clear pupil.

He has had very little trouble with the iris falling in front of the knife. In hypermature cataracts with tough capsules and weak suspensory ligaments he advised opening with the forceps. A table of 26 cases is appended. Alling.

After the cataract has been extracted FRANÇOIS (129, **Immediate discission of the posterior capsule in cataract operation**) introduces a cystotome into the anterior chamber and makes linear incision into the posterior capsule from the lower margin of the pupil upwards. He thinks the results as to the vision are better and that the procedure obviates a subsequent needling.

SCHOENBERG.

ZIEGLER (131, **Adventitious membrane following operation for secondary cataract**) has observed in a few cases a diminution in vision which he attributes to the formation of a delicate membrane; in the pupillary area. The only sign is a faint iridescent sheen covering the whole surface of the vitreous body. It may appear at any time after the discission. The treatment which he advises is his V-shaped capsulotomy.

ALLING.

TERSON (130, **Remarks on preliminary iridectomy and cataract extraction in diabetics**) says that the general consensus is that in diabetics, cataract extraction is frequently followed by iritis and that preliminary iridectomy is a good measure of preventing total occlusion of the pupil.

SCHOENBERG.

GONZALES (128, **Spontaneous rupture of Morgagnian cataract**) relates the case of a woman 75 who had a cataract removed from one eye about twenty years ago. Nothing was done with the other. Fourteen years after the extraction she was suddenly attacked with acute pain in the unoperated eye. There was marked congestion and rise of tension which subsided under local treatment. He thinks that the cataract was in the Morgagnian stage and the capsule ruptured spontaneously, filling the anterior chamber with albuminous fluid and causing the glaucoma. Since that time the eye has remained quiet and the nucleus has not been absorbed.

ALLING.

XIV.—GLAUCOMA AND INTRAOCULAR TENSION.

132. ELLETT, E. C. **A case of intraocular sarcoma with unusual operative history.** *American Journal of Ophthalmology*, October, 1920.

133. FRANZ. **Hypotonia bulbi with intraocular tumors.** *Klin. Monatsbl. f. Augenheilkunde*, February-March, 1920.

134. Gradle, H. S. **Cyclodialysis.** *American Journal of Ophthalmology*, January, 1920.

135. Knapp, A. **Hypotony after trephining.** *Ibid.*, February, 1920.

136. Weeks, J. E. **Personal observations regarding the treatment of glaucoma.** *Journal A. M. A.*, October 11, 1919.

137. Wiegmann. **Trephining for glaucoma.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., p. 117.

Ellett (132, **Intraocular sarcoma with unusual operative history**) did a trephining on an eye with acute glaucoma and a history of failing vision for six months. The following day the wound was filled with a prolapse of retina and vitreous. The eye was then enucleated and found to contain a sarcoma. The case illustrates the fact that a hard blind eye, with the other normal, should be looked upon with suspicion of intraocular tumor. Alling.

Wiegmann (137, **Trephining for glaucoma**) suggests the following modification for the formation of the flap. A very thin knife is introduced in the most superficial tissue of the cornea, and a counterpuncture made about 4*mm* distant, and an incision is made so as to include with the corneal a small scleral flap and a larger one of the conjunctiva. After bleeding has been checked the flap is lifted and the trephining done in the usual manner.

Knapp (135, **Hypotony after trephining**) notes the fact that occasionally hypotony results from too free filtration after trephining, and thinks that, if prolonged, it is capable of producing serious results. The effect desired should be sought by the use of a smaller trephine, rather than by leaving part of the disk. He relates his experience with six eyes in which too low tension persisted for a number of years. One eye developed iridocyclitis, two cataract, and three detachment of the choroid. Alling.

Weeks (136, **Treatment of glaucoma**) has performed the trephine operation fifty-eight times, and has had two intraocular hemorrhages, six cases of iritis, two of detachment of the choroid, two of late infection, and a number in which there was a return of the tension. Now he limits the operation to buphthalmos. He has done the Lagrange operation 269 times and relies upon it exclusively.

Alling.

According to GRADLE (134, **Cyclodialysis**) cyclodialysis should be performed when an eye is free from inflammation. It is successful in about fifty per cent. of the cases. Temporary results are obtained in twenty per cent., but thirty per cent. are failures.

ALLING.

FRANZ (133, **Hypotonia bulbi with intraocular tumors**) reports three cases in which the hypotonia was marked. A tonometric measurement was made in only one case, and in this the tension of the eye containing the tumor was from 6 to 8*mm* below that of the other eye. The tumors were associated with an extensive detachment of the retina in all three cases, and in two the tumor extended to the ciliary body. No anatomical condition was found to explain the occurrence of the hypotonia. In one case the ciliary body was injured by the situation of the tumor, and in all the blood vessels of the choroid, ciliary body and iris were distended. No changes could be demonstrated which pointed toward a diminution of the secretion of aqueous and thereby a reduction of the intraocular tension. In all three the vitreous was shrunken and the filtration angle, as well as Schlemm's canal, was wide open. Possibly the hypotonia may have been due to an increased escape of the aqueous.

XV.—THE RETINA AND VITREOUS.

138. CHANCE, B. **Symmetric macular degeneration in a brother and sister.** *American Journal of Ophthalmology*, April, 1920.

139. DARIER, A. **A case of retinal detachment in a myope cured by puncture of the sclera and subconjunctival injections.** *La clinique ophtalmologique*, viii.

140. DAVIS, A. E. **Recurrent retinal hemorrhage in adolescence.** *American Journal of Ophthalmology*, September, 1920.

141. DE SCHWEINITZ, G. E., and WIENER, M. **1. Cysticercus of the vitreous. 2. Congenital multilocular cysts in relation with the retina. 3. Anterior lenticonus.** *Journal A. M. A.*, October 18, 1919.

142. ELLIOT, R. H. **A study of the results of infection of the vitreous body with septic material in couched eyes.** *British Journal of Ophthalmology*, February, 1919.

143. FERNANDEZ, F. M. **Multiple aneurysms of the retinal arteries.** *American Journal of Ophthalmology*, September, 1920.

144. HAAB. **Studies with the ophthalmoscope.** *Arch. f. Augenheilkunde*, lxxv., p. 113.

145. HEDDE. **Grouped nævoid pigmentation of the retina.** *Klin. Monatsbl. f. Augenheilkunde*, February-March, 1920, p. 301.

146. HESSE. **Prolapse of vitreous into the anterior chamber.** *Zeitschr. f. Augenheilkunde*, xlii., p. 191.

147. HOWARD, H. J. **The origin of the vitreous.** *American Journal of Ophthalmology*, August, 1920.

148. JACKSON, E., and FINNOFF, W. C. **Tuberculosis of the retina.** *Ibid.*, October, 1919.

149. JACKSON, EDWARD. **Thrombosis of retinal veins after influenza.** *Ibid.*, December, 1920.

150. KUSAMA, K. **X-ray treatment of retinal glioma.** *Ibid.*, September, 1919.

151. MIDDLETON, A. B. **Macular hole in the retina.** *Ibid.*, November, 1919.

152. STARGARDT. **A postoperative panophthalmitis by gramnegative micrococci.** *Zeitschr. f. Augenheilkunde*, xlii., p. 227.

153. TERSON, A. **Traumatic detachment of a retinal vein.** *Archives d'ophtalmologie*, xxxvi., 7.

154. TRAQUAIR, H. M. **Hereditary glioma of the retina.** *British Journal of Ophthalmology*, January, 1919.

155. ZENTMAYER, WILLIAM. **Recurrent retinal hemorrhages.** *American Journal of Ophthalmology*, September, 1920.

MIDDLETON (151, **Macular hole in the retina**) out of 100,000 men examined at Camp Travis, found 23 cases of hole in the macula. The holes were as a rule circular but a few were elliptical with the long axis generally horizontal. Four cases were associated with rupture of the choroid. As a rule there was a halo of pigment in the retina about the hole. Small white retinal spots were seen in most of the cases and were probably due to hemorrhages at the time of the injury. In every case the pupil was slightly larger than the other but the author's explanation, that this was due to the macular defect, is hardly sound. In one case only was there no history of injury to the affected eye.

ALLING.

DARIER (139, **Retinal detachment cured by puncture of the sclera and subconjunctival injections**) claims that by this treatment he has cured ten per cent. of the sixty cases he has seen during the past twenty years.

SCHOENBERG.

CHANCE (138, **Symmetric macular degeneration in a brother and sister**) found in the eyes of these two patients a somewhat similar picture in the form of a well-marked circular area of retinal absorption at the macula. The patches were a little larger than the disk and were surrounded by pigment. The base was formed by the choriocapillaris. The eyes had defective color perception and the fields of vision were contracted. The cases are undoubtedly manifestations of degeneration of the retina and probably not congenital in origin. Syphilis and tuberculosis were both excluded.

Alling.

Davis (140, **Recurrent retinal hemorrhage in adolescence**) studied two cases, both males, in good health with history of tuberculosis in the family and negative as to syphilis and gonorrhœa. Both reacted to the tuberculin test. Each had recurrent hemorrhages, retinitis proliferans, and finally detachment of the retina with loss of vision. Two types are described —one where at first there is a perivasculitis of the retinal veins and the other in which the central veins and optic nerve are involved. The weight of opinion seems to lean toward tuberculosis as the cause of this obscure disease.

Alling.

Zentmayer (155, **Recurrent retinal hemorrhages**) thinks that the thyroid extract is of real value in the treatment of these cases, in view of the variability of the factors in different cases. The absence of definite evidence of tuberculosis, the fairly constant age, that is adolescence, its occurrence in males, the low vitality of the patients, and the beneficial effects of the thyroid treatment, he suggests that the disturbance in the endocrine organs may have bearing on the ætiology of the condition.

Alling.

Fernandez (143, **Multiple aneurysms of the retinal arteries**) was consulted by a patient 54 years old who for six weeks had noted a marked reduction of vision amounting to $\frac{6}{200}$ in one eye. Along the course of the arteries were numerous aneurisms and small hemorrhages. There were also a number of atrophic patches which evidently were the result of previous hemorrhages. The general arterial tension was 180*mm* with signs of general arteriosclerosis. The patient died 40 days after the examination. While the prognosis for life is poor in the elderly, aneurisms occasionally occur in the young, sometimes due to tuberculosis, and are less serious.

Alling.

The first case described by JACKSON and FINNOFF (148, **Tuberculosis of the retina**), a man of 28, appeared with small areas of infiltration in each cornea accompanied by congestion and irritation. Later perivasculitis of the retinal veins ensued with attacks of hemorrhage and the case, after two and a half years, presented the appearance of retinitis proliferans in the right, although the left cleared soon after the onset. Tuberculin was given more or less regularly. It seemed probable that the infection was with the bovine tubercle bacillus because the patient was known to have drunk tuberculous milk and because there was a marked focal reaction after the injection of bovine tuberculin. The second case showed small grayish white spots radiating from the macula, dilated veins, and small hemorrhages in one eye. Tuberculin was begun and the eye gradually cleared. Evidences of pulmonary tuberculous lesions were also found. The last case gave a history of attacks of retinal hemorrhages which cleared. When first examined he had dense floating opacities in the vitreous and choroidal patches in the left. As the lung apices were infiltrated, he was put upon general treatment. Except for slight vitreous opacities the eyes completely recovered. Retinal tuberculosis begins with white infiltration generally in front of the retinal veins. Later the vessels show perivasculitis with altered caliber. Hemorrhages then appear either in the retina or bursting into the vitreous and may be followed by retinitis proliferans.

White spots appear at the macula in some cases. Case not accompanied by pyrexia or extensive lesions elsewhere, do well under tuberculin.

ALLING.

KUSAMA (150, **X-ray treatment of retinal glioma**) relates his experience in three cases of glioma affecting both eyes treated by X-ray and radium. The treatment resulted in complete disappearance of the growths but also the shrinking of the eyeballs. Unfortunately all three children died very shortly, one from meningitis and the others from metastases. The author concludes that, although the tumors were destroyed in the orbit, the deeper portions may have escaped and being thus stimulated, hastened the formation of extensions and secondary growths. Metastases in glioma occur in the majority of cases in the cranial bones or the brain, occasionally in the lymphatic glands and rarely in the liver and elsewhere. If the X-ray is applied in sufficient strength and duration it is possible to produce maceration of the lids, necrosis of the cornea, and phthisis bulbi, as in the cases related. Experiments have shown that the ray has a deleterious effect upon the growing eye in the young producing cataract and degeneration.

ALLING.

TRAQUAIR (154, **Hereditary glioma of the retina**) reports three cases of hereditary glioma. The father when six months old had his left eye removed for a tumor, almost certainly glioma, by Argyll-Robertson. Two children were born alive, one stillborn. Both children died from glioma in the eye, consent to operation being refused. Such reports are becoming more frequent, and no one can now question the fact that glioma is a hereditary disease.

T. HARRISON BUTLER.

TERSON (153, **Traumatic detachment of a retinal vein**) describes a case of this nature, which he claims to be the first on record.

SCHOENBERG.

JACKSON (149, **Thrombosis of retinal veins after influenza**) relates two cases which showed the picture of retinal thrombosis and quotes the literature of the subject. Influenza is known at times to cause thrombosis of the large peripheral vessels as well as of the brain. Both of his cases entirely recovered and he thinks the prognosis good.

ALLING.

In HEDDE'S (145, **Grouped nævoid pigmentation of the retina**) case minute points were grouped together into larger spots that presented an appearance like that of lobes of glands, the majority of them in the periphery, leaving the macula free. They were independent of the courses of the vessels. In the upright image they showed a very finely granular appearance, which was looked upon as a characteristic of the pigment epithelium. The patient had also several small nævi on the skin, and Hedde considers the anomaly to have been congenital.

HAAB (144, **Studies with the ophthalmoscope**) discusses the traumatic affections of the macula, of which he distinguishes three forms: (1) those due to contusion; (2) those caused by the presence of a foreign body in the eye; (3) those due to pressure on the globe from behind. In fresh cases of the first class opacities appear in and about the macula, as well as a little central bright spot, due to a changed foveal reflex, or a substratum behind the retina. He does not think that the opacity of the macula can be explained as due to *contre coup*. The permanent changes come later and consist of markings, often like those seen in myopia, yet the vein-like figures are usually wanting. Changes take place in the pigment epithelium, but it is hard to determine the part taken by the ciliary vessels. It is very rarely that these changes retrogress. Lacerations of the choroid are rare. After removal of a cataract caused by a contusion the macular affection may give a poor result. Such defects may be found after delivery by forceps, when the foveal reflex may be absent, and fine white spots present between the macula and the papilla. In the second class of cases the distant action of bits of iron upon the macula makes itself manifest very soon, although there is no such predilection as when bits of copper are in the eye. The third class of cases is illustrated by one of angioma of the orbit with protrusion of the eye, which he studied anatomically, but examples were frequently seen during the war, caused by shot wounds.

HOWARD (147, **Origin of the vitreous**) examined an eye which was removed for suspected glioma and found a condition of the vitreous which appears to throw light upon its origin. There were found three varieties of vitreous fibers. First ectodermal protoplasmic fibrillæ which represent the first stage of development in the embryonic state. Its use is support for the hyaloid vascular system which begins during the seventh week. Its existence is transitory. The second variety consists of fibers originating from the pars ciliaris retinæ and normally extend through the whole retina disappearing later. Thirdly a connective tissue of mesodermal structure which springs from the cells of the fibro-vascular sheath of the lens and displaces the second.

ALLING.

HESSE (146, **Prolapse of vitreous into the anterior chamber**) reports a number of cases in which a drop of vitreous with a transparent envelope had penetrated between the iris and the lens into the anterior chamber as far as the margin of the pupil. The iris and lens were separated by the prolapse, so that the depth of the anterior chamber was altered. The wall of the drop of vitreous was stained by blood or pigment. The lens was displaced slightly in all but one case, in which it was dislocated. The cause in one case was a perforating wound, in all but one of the others a contusion, that lacerated the zonula and so allowed the vitreous to enter through the posterior chamber. In one case there was no history of traumatism, but one of high myopia with detachment of the retina and displacement of the lens.

Two days after an operation for detachment of the retina by STARGARDT (152, **Postoperative panophthalmitis by gramnegative micrococci**) evidences of an infection appeared. The fluid taken from the eye showed gramnegative, fairly large diplococci, mostly in leucocytes crammed with the bacteria. The eye had to be exenterated later, and cultures from its contents revealed the same diplococcus. On nutritive media it developed a very luxuriant growth in the form of a whitish gray coating. This microörganism is distinctly different from the gramnegative micrococci that have been described hitherto, and belongs to the bacteria of the gonococcus and meningococcus group, which contains a large number of nearly related forms. Whence the microörganisms came could not be determined.

Not the least interesting feature of Colonel ELLIOT'S (142, **A study of the results of infection of the vitreous body with septic material in couched eyes**) paper is the three pages of photographs of the sectional globe. These are the work of Mrs. R. H. Elliot, and rank with the very best result of professional work.

In 1911 the late Professor Straub of Amsterdam read a paper to the Ophthalmological Society upon the pathology of certain opacities which develop in the vitreous when the ciliary body has been deliberately infected with tubercle bacilli. He found that: The optic nerve head became inflamed. In the vitreous were found a number of leucocytes, seated upon thin membranes, lying upon the granuloma which had developed in the vitreous and the inflamed optic disk. Aggregations of leucocytes were found upon the walls of the cavities of the eye, on the cornea, the lens capsule, the retina, and in cavities of the vitreous. Straub argued from these findings that the current of the lymph in the vitreous goes by the optic nerve, and he inferred that in cyclitis a slight haziness of the retina and some optic neuritis must be expected.

When Elliot began to examine eyes which had been removed at Madras after unsuccessful couching, the first feature noted was the frequency of changes in the vitreous. Colonel Kirkpatrick has commented upon the fact that the vitreous in these eyes is shrunken, a clear space is left occupied by aqueous.

Elliot has examined 54 globes removed after couching operations. He concludes that the changes found do not support Straub's view that there is a clinical entity "hyalitis." The important element is septic infection of the ciliary body, the retina, and the choroid. There was no evidence that localized cultures of organisms were present in the vitreous, on the contrary the virus is evenly distributed through the vitreous. It appears that these organisms cause chemotactic action and that the brunt of the assault falls upon the retina. The appearances found suggest that some at least of the lymph from the eye takes a backward passage and escapes by channels in or near the optic nerve. T. HARRISON BUTLER.

DE SCHWEINITZ and WIENER (141, 1. **Cysticercus of the vitreous. 2. Congenital multilocular cysts in relation with the retina. 3. Anterior lenticonus**) discovered a cysticercus in a blind eye and attempted to remove it through an incision in the sclera but the forceps ruptured the cyst and nothing could be brought away. The eye was enucleated later on account of inflammation. 2. There was a large transparent balloon-like cyst protruding from an atrophic area near the macula. From this there extended a tube which ended in a widespreading cystic mass covered with vesicles and blood vessels. 3. Each lens which was small and slightly hazy presented a pronounced cone with the tip almost touching the posterior surface of the cornea.

ALLING.

XVI.—ACCIDENTS, INJURIES, FOREIGN BODIES, PARASITES.

156. CLAPP, C. A. **Removal of steel from the eye from an industrial standpoint.** *American Journal of Ophthalmology*, May, 1920.

157. DE LA PERSONNE, F. **Results of early treatment of wounds of the orbit and eye.** *Archives d'ophtalmologie*, xxxvi., 7.

158. de Schweinitz, G. E. **Concerning concussion and contusion injuries of the eye in warfare.** *American Jour. of Ophthalmology*, May, 1919.

159. Dor, L. **Traumatic hemeralopia.** *Clinique ophtalmol.*, viii., 2.

160. Dor, L. **The technic of extracting nonmagnetic foreign bodies from the vitreous.** *Ibid.*, viii., 3.

161. Gifford, H. **Rupture of cornea by contrecoup from bullet wound of the orbit.** *American Journal of Ophthalmology*, November, 1920.

162. Holmes, Gordon. **Disturbances of visual orientation.** *British Journal of Ophthalmology*, September, 1920.

163. Krauss. **Ophthalmo-surgical experiences in wounds of the skull during the war.** *Klin. Monatsbl. f. Augenheilkunde*, February-March, 1920, p. 194.

164. Mohr. **Rupture of the optic nerve by contusion.** *Ibid.*, p. 310.

165. Morax, Moreau, and Castelain. **The various types of macular vision disturbances after traumatic lesions of the occipital region.** *Annales d'oculistique*, clvi., 3.

166. Moreau, F. **Pseudosyndrome alternans.** *Ibid.*, clvi., 3.

167. Perrin, R. **Keratitis due to melinite.** *Ibid.*, clvi., 3.

168. Shoemaker, W. T. **Penetrating and perforating wounds of the eyeball and treatment of retained foreign bodies.** *American Journal of Ophthalmology*, August, 1919.

169. Uhthoff, C. A. **Four cases of cysticercus subretinalis in soldiers.** *Klin. Monatsbl. f. Augenheilkunde*, February-March, 1920, p. 180.

170. Wiegmann. **Two cases of injury of optic nerve with unusual course after trauma to the skull.**

171. Yoshida, Y. **Wasp-sting, with special color changes in the iris.** *American Journal of Ophthalmology*, July, 1920.

Disturbances of visual orientation, meaning thereby an affection of the power of localizing the position in space and the distance of the objects by sight alone, are among the rarer conditions due to cerebral lesions met with in civil practice. Six cases of perforating gunshot injuries of the head in young healthy adults, in which this condition was present, form the basis for Holmes's (162, **Disturbances of visual orientation**) paper. These cases are exhaustively recorded and are illustrated with diagrams of the situations of the wounds and charts of the fields of vision.

The symptoms can be divided into two groups; the first includes the disturbance of orientation and localization in space by sight, the inability to estimate absolute and relative distances, and the failure to recognize relative lengths and sizes; while in the second group can be placed together the disturbances of the movements of the eyes and ocular reflexes, that is, the difficulty in fixing objects seen and in keeping the eyes fixed on them when they are moved, the failure to converge on and accommodate for near objects, and the absence of the blinking reflex.

Holmes emphasizes the fact that the symptoms presented by these cases cannot be attributed to defects of visual perception, as in four of the cases the central vision was normal or approximately so and in the remaining two it was certainly moderately good, although it was not possible to measure it accurately. In all the cases there were some defects in the visual fields, but the visual loss never approached the central zone and it is a fact that the spatial orientation of objects seen is not influenced by the presence of hemianopia or other large losses in the fields of vision, whether they be due to cortical, subcortical, or tract lesions.

The affection of visual orientation was obvious in several tests; the patients were unable to touch accurately any objects within their reach and vision, though the movements of the arms were intact; in walking they collided with easily visible objects and had difficulty in finding their way around them; often they could not easily recognize the relative positions of two similar objects in space; in attempting to touch an object they made mistakes in all three planes of space, that is in judging its lateral and vertical position as well as its distance. Holmes, in discussing these symptoms, compares retinal sensibility to cutaneous sensibility and points out that in certain cerebral lesions the locality of a tactile stimulus can no longer be recognized, though there may be no affection of either the threshold of sensibility or of the quality of the sensations evoked.

In all the cases it was in the estimation of distance that the greatest disorder of function was seen; distances were usually overestimated, showing defect in the proprioceptive impulses from the ocular muscles, especially on those excited by convergence and accommodation.

A striking symptom in five of the cases was the difficulty they experienced in finding their way about in new surroundings or in those in which they were not especially familiar. It would appear probable that in these cases the cerebral mechanisms, by which the spatial percepts received through the different senses are associated and assimilated with past experiences, were involved.

Other striking symptoms were the inability to explore a limited surface properly with the eyes, and to enumerate conspicuous objects on it; the relative positions of words in the page were not recognized promptly and were not brought in proper succession into central vision; the failure to observe portions of surfaces in front of their eyes (though falling on functionating portions of the retina).

Stereoscopic vision appeared to be intact in all the cases. With regard to the more purely ocular symptoms, disturbance of fixation was the most prominent of these; the patient when asked to look at an object would roll his eyes about until he found, as if by chance, the object sought. This impairment of fixation would naturally result from defective spatial orientation, as when the position of the object, which throws its image on the retinæ, is not properly appreciated, the eyeballs cannot be rotated so as to carry the exciting image to the macula.

Now, as in all these cases the wounds involved the region of the angular gyrus, it might be suggested that it was to the absence of accurate fixation and accommodation that the disturbance of visual orientation was wholly due; Holmes however points out that normal persons can locate with far greater accuracy than those patients the position in space of objects when their images fall only on extramacular portions of the retina, and further in a man in whom a midbrain and pontine tumor had abolished all ocular movements and accommodation the power of localization was far superior.

The act of blinking was abolished in five of these patients. Blinking therefore seems to be a forebrain reflex dependent on the functions of the centers which were injured in these cases, although an alternative suggestion could be offered that the absence of the reflex may be due to disturbance of perception of the distance of the threatening object. With regard to the anatomical positions of the lesions, in the first place in all six cases both hemispheres of the brain were injured by perforating missiles; in the second place the available anatomical facts indicate that in all cases the lesions on the lateral surfaces of the hemispheres lay within a zone which included in its center the angular and supramarginal gyri, and extended into the adjoining occipital, temporal, and parietal convolutions. The structures injured by the passage of the missiles are more uncertain, but the wounds on the mesial surfaces of the hemispheres probably all lay in the region of the splenium. Probably also the upper fibers of the optic radiations were involved.

P. G. DOYNE.

YOSHIDA (171, **Wasp-sting, with special color changes in the iris**) saw his case about one month after the eye was stung by a wasp. There was swelling of the lids and some injection of the bulbar conjunctiva. The cornea showed in its entire extent a diffuse grayish opacity most marked in the center, which under the loupe was seen to be made up of numerous fine dots. The surface was roughened and presented in its center a few vesicles. The pupil was wide and fixed. The most striking change was in the iris which showed a bluish discoloration and blurred markings. There were also a few opacities in the lens. An optical iridectomy was done later and the specimen examined. The anterior limiting membrane was found altogether wanting so that the vascular layer was laid bare and to this is attributed its peculiar color.

ALLING.

DE SCHWEINITZ (158, **Concussion and contusion injuries of the eye in warfare**) discusses broadly the general and peculiar characters of war injuries of the eye. As special types of concussion and contusion injuries, compared with those met with in civil practice, may be mentioned cases without perforation showing reduced intraocular tension—commotio retinæ with more numerous hemorrhages, a yellow retinal haze and of a longer duration—chorioretinitis proliferans generally with rupture of the membranes and a cicatricial process leading to pinning down of the retina rather than to detachment.

ALLING.

DOR (159, **Traumatic hemeralopia**) describes the sixth case of this nature he has seen. The patient, an army officer twenty-five years of age, remained for twenty-three days in a state of coma, after a fall on his head. Convalescence was protracted and when he returned to his duties, six months later, he noticed that he could not see at night. When examined by the author ten months after the accident, his vision and fundus were found normal, but the fields for yellow and blue were markedly contracted. The fact that the patient had fulfilled the duties of an army officer for three years preceding the accident excludes the possibility of a congenital hemeralopia.

SCHOENBERG.

DOR (160, **The technic of extracting nonmagnetic foreign bodies from the vitreous**) advises the use of a special forceps having two small spoons at the end, which spoons can be approached and separated by sliding a tube up or down the opposite end of the forceps. After the incision is made in the eyeball, in the region of the equator, the forceps is introduced as soon as the knife is removed, so that no vitreous should be lost. With the aid of a head mirror, strongly illuminated, light is thrown into the interior of the eye and the end of the forceps are opened; the foreign body caught between the spoons, the forceps is closed again and the body is extracted. By this method the author has succeeded in extracting two pieces of copper from the same eye, one 1 *mm*, the other ½ *mm* in size.

SCHOENBERG.

CLAPP (156, **Removal of steel from the eye from an industrial standpoint**) reports a series of 49 cases with the following results: Four cases retained normal vision, six aphakic eyes had vision from $\frac{20}{50}$ to $\frac{20}{20}$; 10 had useful vision, 7 light perception and 11 were lost, 7 were operated upon by the posterior route.

ALLING.

GIFFORD (161, **Rupture of cornea by contrecoup**) relates three cases in which a bullet passed through the orbit and a rupture of the cornea occurred. He experimented upon sheep and dogs but found in only two eyes a reproduction of the condition. He thinks that the rupture is not due to the entrance of gas from the explosion nor to explosive effects in the orbital tissue but to contusion of the posterior pole of the globe and the transmission of the force to the anterior pole by contrecoup.

ALLING.

Of the 218 cases of shot wound of the head operated on by KRAUSS (163, **Ophthalmo-surgical experiences in wounds of the skull**) the bones of the skull were not injured in 110, and were more or less badly broken up in 108. The optic papilla was affected in 14 of the first group, ten with choked disk, four with papillitis. Operative measures, in the form of lumbar puncture, were required in three cases, all of which recovered. All of the cases in the second group had to be operated on as quickly as possible. Only 45 of the 108 exhibited permanently normal conditions of the papilla. There were 14 cases of choked disk, 41 of papillitis; the former usually with uninjured, the latter always with injured dura. Almost a third of the second group died within twelve days, mostly from purulent encephalitis or meningitis. Krauss believes that after every penetrating wound of the skull the patient should be kept under ophthalmological observation for at least two weeks. Swelling of the papilla two or three days after the injury he considers a symptom of a complication, and to be of unfavorable prognostic import while papillary signs appearing later he thinks distinctly threatening. Every shot wound of the skull should be looked upon as infected, and surgical measures should be taken from this point of view, to do away with the primary infection and prevent a secondary.

WIEGMANN'S (170, **Two cases of injury to the optic nerve with unusual course after trauma to the skull**) first case was that of a man 56 years old who was struck on the left side of his head. The blow rendered him unconscious for a short time, but there were no symptoms of fracture of the bones, or of the base of the skull. On the day of the accident he had only obscurations and a feeling of weight in his head, but the next morning he was totally blind. After a transient return of light perception he again became totally blind at the end of three weeks. At the same time the papillæ became pale. Wiegmann thinks that in this case there was a bilateral crushing of the optic nerves in the optic canals which did not destroy the nerve fibers immediately, but occasioned a total degeneration. The second case was one of penetrating shot wound of the skull. A year and a half after the injury the vision of both eyes became reduced to counting fingers at a meter, with a bilateral central absolute scotoma, the peripheral portions of the fields remaining normal. The condition remained thus for a year. Then the vision was about half the normal, the right papilla showed a trace of paleness, and there was still a small relative central scotoma in the left eye. The track of the shot could be traced in the roentgenogram from the posterior bony root of the nose to the neighborhood of the sella turcica.

MOREAU (166, **Pseudosyndrome alternans**) relates on a case of a fracture of the skull in a patient 47 years of age who exhibited on the left side, hemiplegia; on the right side, facial paresis, moderate ptosis, exophthalmus and immobility of the eyeball with a dilated immobile pupil. Hemorrhages on and around the optic disk. Vision equals 0 –. Anæsthesia corresponding to the area supplied by the three branches of the right fifth nerve. This condition, called by the author *pseudosyndrome alternans* gradually cleared up almost completely during the following few months. The mydriasis gave place to a myosis and the vision remained nil. The author thinks he has had to deal with a subdural hæmatoma on the right side, extending into the sheath of the right optic nerve. All the symptoms were referable to the pressure caused by the hæmatoma and disappeared soon after this was resorbed.

SCHOENBERG.

The most important lesson taught by the experience with war wounds of the orbit and eyes is to operate as early as possible, to be as conservative as possible, and to suture the wound immediately. DE LA PERSONNE'S (157, **Results of early treatment of wounds of the orbit and eye**) experience embraces 2449 cases with 83 operations. Most of the operations were done under local anæsthesia. Primary union was obtained in cases operated on less than forty-eight hours after the injury.

SCHOENBERG.

MORAX, MOREAU, and CASTELAIN (165, **The various types of macular vision disturbances after traumatic lesions of the occipital region**) have had the opportunity of studying 86 cases of macular vision disturbances following occipital wounds. They classify these disturbances as follows: (1) Typical homonymous hemianopsia; (2) homonymous sector hemianopsia, involving a quarter, at the most, 15 degrees at least of the field of vision of each eye; (3) homonymous scotoma, occupying only a portion of the lateral sectors. A bilateral lesion may give a combination of two of the above types and result in (4) homonymous hemianopsia plus scotoma hemianopsia on the opposite type; (5) double scotoma hemianopsia; (6) homonymous hemianopsia plus central scotomas; finally (7) complete blindness from total destruction of both visual centers.

The cases of typical homonymous hemianopsia may have the macula spared. They do not complain of any visual disturbance and are only discovered by a routine perimetric examination. The authors have seen 20 such cases. Their acuity of vision, the stereoscopic as well as the diploscopic vision, was not affected. The hemianopsia approaches within five to six degrees from the point of fixation. Other cases (8) have the macula involved and the blind field approaches the point of fixation within 1 to 1½ degrees. The acuity of vision, stereoscopic and diploscopic vision, are usually normal. The lesion is to be found in the occipital lobe opposite to the field defects. The cases of sector homonymous hemianopsia (15 cases) show a more or less triangular defect with the apex of the triangle very near the fixation point. The inferior variety is the most frequent one. In 8 cases the sector extended as far as one degree towards the fixation point. The acuity of vision, the diploscopic and stereoscopic vision, were normal.

The cases of hemianopic scotomas showed several varieties: (a) The median type, consisting of a scotoma extending 5 to 20 degrees from the median line of the field and about as much above and below the horizontal meridian; (b) the sector type, triangular in shape, and always occupying a space between the horizontal and vertical meridian; (c) inferior hemianopsia, consisting of a bilateral hemianopic scotoma.

The acuity of vision was normal. The stereoscopic fusion was abnormal in 4 out of 20 cases.

The cases of homonymous hemianopsia associated with hemianopic scotoma on the opposite side are caused by lesions of both occipital lobes. The macular field is involved in some cases and almost always on the same side as the total hemianopsia. The authors saw 14 such cases, 10 of which had an involvement of the macular field (that is the blind field extended within one degree from the fixation point).

Cases of bilateral hemianopic scotomas are rare. These scotomas may be of the median type or they may be both in the lower part of the field.

Cases of homonymous hemianopsia with central scotomas were few and are due to lesions in the median region of the occiput.

Finally a severe trauma may destroy completely both occipital lobes and cause total blindness.

In all the cases the lesion was to be localized in the occipital lobe opposite to the visual field defects. SCHOENBERG.

Four days after the patient had received a severe blow on the eye MOHR (164, **Rupture of the optic nerve by contusion**) observed in the place of the papilla a very deep, abrupt excavation with no visible vessels. A whitish zone surrounded the hole. There were a number of little hemorrhages in the retina. A small fissure of the base of the orbit could be demonstrated roentgenologically, but there was no movement of the fractured part upon each other, and no pain. In consequence of the absence of the hemorrhages into the vitreous which usually complicate cases of this nature, a good ophthalmoscopic study of the condition was possible from the first. The nerve fibers seemed to have ruptured at the lamina cribrosa, leaving the sheath intact. The tension of the eyeball was not materially lowered.

SHOEMAKER (168, **Penetrating and perforating wounds of the eyeball and treatment of retained foreign bodies**) thinks that enucleation during panophthalmitis is a fairly safe procedure although he has seen one case of suppurative meningitis following the operation. In the treatment of crude injuries, common in war, he advocates the use of dichloramine T. in eucalyptol, freely used in packing and sprayed in the wounds. Magnetic bodies in the vitreous should be removed through the sclera, preferably with a small magnet. Nonmagnetic bodies in the vitreous generally demand enucleation but the danger of sympathetic ophthalmia, if the foreign body is sterile, is slight and occurs only from infection through the wound. Regarding the indications in threatened sympathy, prolonged cyclitis or uveitis, a gradual lowering of intraocular tension with failure of vision or photophobia and sympathetic irritation in the other eye are three conditions, any one of which demands enucleation. ALLING.

PERRIN (167, **Keratitis due to melinite**) has seen thirty-two cases. These were in soldiers who had been exposed to fumes of melinite; all presented a characteristic clinical picture, consisting of first, gradual, and marked diminution of vision; second, a peculiar milky superficial, subepithelial opacification of the lower portion of the cornea, triangular in shape, with the base upwards; third, the presence of a rainbow colored halo when the patient was looking to a light. The keratitis appeared usually some six to ten months after the patient's continuous exposure to the melinite vapors. Recovery after a stay in the hospital of from six to nine weeks.

SCHOENBERG.

In two of the cases reported by UHTHOFF (169, **Four cases of cysticercus subretinalis**) the wall of the sac was distinctly iridescent as seen with the ophthalmoscope, the situation was in the equatorial region, and the anatomical picture after extraction revealed nothing special. In the third case operation was rendered very difficult by the situation in the macula and the presence of a strong connective tissue capsule. The capsule formation had taken place in the course of five months, and was possibly due to cicatrization. Ophthalmoscopically the case was marked by the good visibility of the morphological characteristics, anatomically by the great new formation of connective tissue and the high degree of degeneration of the parts of the retina adjoining the parasite. In the fourth case the cysticercus was parapapillar, operation was not considered practicable, and the eye remained unirritated for a long time. In none of the cases was there tænia solium of the intestines, cysticercus in the brain or the skin that was recognized, and there was no eosinophilia. Internal treatment was ineffective.

ARCHIVES OF OPHTHALMOLOGY.

THE TREATMENT OF CATARACT.[1]

BY HENRY SMITH, COLONEL I.M.S., LONDON, ENG.

I PROPOSE to open a discussion on the relative merits of the two leading methods of dealing with senile cataract, mature and immature. This, I presume, we all regard as the great issue of to-day in ophthalmology. That it is a burning issue is clear from the vehemence that is displayed in the ophthalmological press. Quotations are oftentimes gathered from men who have little or no practical experience of this intensely practical subject even though they have written books and have honored names in other departments and on the strength of such quotations is used such language as "extraction of cataract in the capsule under conditions existent in a civilized country is utterly inexcusable." The capsulotomy school do not all use quite as strong language as this. Another writer lays down on this subject that the literature on a matter of this kind is always favorable to anything new. Does any one really hold that the intracapsular operation has been received in this way? Does any one hold that Listerism was received with open arms when it was new? Does any one hold that litholopaxy when introduced by Freyer and Keegan, using the instrument devised by your own great citizen surgeon (Bigelow), was received favorably by the genito-urinary surgeons of the world? *No.* These and all similar innovations on time-honored practice have been received with the utmost hostility. I do not think that we, advocates of the intracapsular operation, have any more or less to complain of than innovators in other departments of surgery nor do I think that we or any one should complain of destructive criticism. Controversy has its place and a most useful place in the evolution of such matters and I welcome all controversy which will assist us in sound thinking, and assist us in arriving at a sound verdict and thus contribute to progress. The capsulotomy operation of to-day is practically where Daviel left it. Details have come into existence and gone out of existence with all the frequency and ease which befall philosophic theories. All the same, Daviel's operation is substantially the capsulotomy operation of to-day. A new detail does not make a new operation. We are told that Daviel's operation has held the field since 1745. If its advocates stated that it came into existence in 1745, it was not practiced to any extent until Joseph Lister had established his case, and extraction by capsulotomy in a general sense only commenced to supplant "lens couching" in the early seventies. The late Sir Jonathan Hutchinson (who founded Moorfields in London) told me that they would never have departed from couching in London but for the fact that the vision (following couching) rapidly failed, and finally vanished. He was the first man I have come across who was aware that progressive atrophy of the retina invariably followed the best results of lens couching (night blindness). It was Listerism and cocaine which gave the great impetus to the extraction of cataract.

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[1] Read before Ohio State Medical Meeting, Columbus, Ohio, May, 1921.

The younger members of the profession have to be reminded that the capsulotomy operation, as we know it, has only been extensively practiced for the past forty years. You will thus see that of these two rival operations the capsulotomy operation is not so very much older than the intracapsular as we do it in India to-day which dates from the nineties of the last century.

The capsulotomy operation had, however, a good start as soon as it was practiced extensively, as it had been taught and had been before the professional mind from 1745 as a desideratum. The intracapsular method since I commenced to advocate it and to teach it is hardly twenty years old. I do not claim to be the first man to do intracapsular extractions. Macnamara in Calcutta and Pagenstecher extracted cataract in the capsule by lifting it out on a spoon. I think the first to extract cataract in the capsule by expression in a limited proportion of cases was an American, Dr. J. W. Wright of Ohio, who published a paper in 1884. Shortly after this Malroney did practically the same operation on all his cases. It is a pity that Wright's work did not attract more attention even in his own country. Malroney did a vast amount of excellent work but did not write at all and thus his experience is lost to the ophthalmological world. I have never seen him operate. Neither Macnamara's nor Pagenstecher's method appealed to me. Wright was unknown to me. Malroney's results I had seen but not his methods. I also saw that patients could on occasion squeeze out the lens in capsule successfully themselves. The results of the patient's efforts were excellent. I proceeded to imitate the accident and evolved what I have done independently of anyone. This method may be only in its infancy yet but it promises to be a hardy youth.

We are told that we are received unduly favorably. This is not so. When I read my first paper at the British Medical Association in 1903 on an experience of 6,000 cases I was received with icy coldness. I was on the front of a list for a paper in 1908. There were 6 or 7 unimportant papers below me on the list. At the commencement of the sitting the president said, "I shall reverse the orders of the papers," which left my paper to be taken as read. This was surely not unduly friendly to say the least! However, I have not always been treated with such scant courtesy.

Dr. Herman Knapp is a name which you all revere; his results are frequently put forward with the implication that intracapsular extraction could not give better results. It may surprise American ophthalmologists to hear that, after he read the paper I brought before the British Medical Association meeting in 1903, before alluded to, he wrote to me, "If you can devise a method to extract cataract in the capsule you will be a greater benefactor to mankind than Daviel. If I were not over 70 years of age and in delicate health I would go round the world to see how to do it."

This was the first word of encouragement that I received from ophthalmologists and that letter is the foundation of the welcome I have given to American ophthalmologists in Jullunder and Amritsar.

I will now put before you in a general way the advantages and disadvantages of these two rival operations. Intracapsular extraction is only within the range of men who have had high-class technical training in the art. It is a difficult operation. The capsulotomy operation is a relatively easy and simple one. Intracapsular requires a skilled assistant. The same amount of skill is not required on the part of the assistant in the capsulotomy operation. Any incision if large enough for intracapsular and any flap will do equally well in either operation according to the preference of the operator. Similarly an iridectomy or no iridectomy may be done. The intracapsular can be done with equal ease at any stage of maturity. In the capsulotomy operation the cataract should be mature. After-cataract follows the capsulotomy operation and requires to be operated upon. There is no after-cataract after an intracapsular operation. Iritis is a frequent complication after capsulotomy but is practically absent after the intracapsular operation. Vision is better after intracapsular than after capsulotomy. Vitreous escape in skilled hands is about the same in both operations. Sepsis more frequently follows the capsulotomy operation. This is often due to tags of capsule left in the wound. Two disadvantages by the intracapsular operation are:—a somewhat larger proportion of prolapse of iris in the non-iridectomy cases, and a slightly drawn up pupil in the iridectomy cases. Choroidal detachment is equally common to both.

I would like now to go into a few details with you.

Iritis. Before I raised this issue in 1903 it was the generally accepted view that iritis following cataract extraction was due to the bruising of the iris in the process of extraction. I stated that that chapter would have to be rewritten as iritis did not follow in one in 500 cases in extraction of the lens in capsule, through an entire pupil which had not been acted on by a mydriatic though there must of necessity be much more bruising of the iris in the latter case than in the capsulotomy operation. Iritis, therefore, is caused by the lens matter and capsule left behind in the capsulotomy operation as I have often previously laid down. This view has since that date been accepted but no credit has been given to intracapsular extraction for demonstrating this fact. I now go further and say that it is caused more by lens capsule left behind than by lens matter. This is evidenced by the fact that when the capsule bursts in intracapsular extraction if we are able to extract the capsule and yet leave a little lens matter behind (as is often the case) iritis does not follow, but if the lens capsule is left behind iritis frequently does follow and the greater amount we leave behind the more likely is it to follow.

Since intracapsular extraction came prominently into the field our opponents of the capsulotomy school tend to make little of iritis, both of its frequency and of its consequences. In my observation it is much more frequent than many of the papers published would lead us to believe. It is not an unimportant complication. I consider iritis a serious complication causing the iris to be cemented to the after-cataract and the pupil often to be occluded with a dense membrane, if no more sinister consequences happen. I have seen any number of such cases operated by most experienced operators in India, such patients being told that nothing more can be done for them. If you who operate by the capsulotomy method do not often come across such cases you are highly to be complimented. Time does not permit me to deal with the treatment of after-cataract of this nature. After-cataract is a subject for a whole sitting in itself.

After-Cataract. If you refer to the journals of the past you will observe that before the year 1903 the treatment of after-cataract was the evergreen of ophthalmological meetings. Before that date the treatment was regarded as serious, from the point of view of the patient, as the extraction of the cataract itself. Mr. Richardson Cross opened a discussion on this subject at the B. M. A. 1901, in which he laid down that the ideal extraction of cataract was in the capsule but that that was not possible and this was tacitly admitted by the meeting. So much for the significance of after-cataract at that time. Since 1903 if you look up the discussions on after-cataract you will notice the change that has come about. It has hardly appeared as a full-dress subject at any meeting. You would infer that to-day the treatment of after-cataract is a trifling unimportant proceeding associated with no sinister results.

When we consider that Listerism applied then as it does now and that the same instruments and methods were used then as now the position seems inexplicable.

In my observation just as severe forms of after-cataract occur now as did then and as severe results are associated with the needling of them. The removal of a portion of the anterior capsule having become more fashionable than it was then, may render the after-cataract a little less dense in the case of mature cataracts, but when we recognise the fact that since intracapsular extraction came into the field for any stage of immaturity, the policy of extracting by capsulotomy of immature cataract has also come into the field with the result that in these cases the after-cataract must be dense and must be dealt with so that in my opinion dense after-cataract is as frequent as ever it was.

This view is supported by the fact that in the U. S. A. you have advocates who laud the introduction of needling an immature cataract so as to cause it to mature in a day or two. This fact is evidence that it is recognized that a dense after-cataract follows the same process in America that it does in India. To my mind this method only needs to be mentioned to be condemned. Such a proceeding deliberately produces a traumatic cataract. Who has ever seen a traumatic cataract in a patient without a violent iritis. I have not and I have seen many of them. I go further and say that these are the most difficult of all cataracts to deal with. If we decide to extract immature cataract we must pull our courage together and extract it in the capsule.

The Incision—One of the objections raised against intracapsular extraction is that the incision is of necessity too large, not exceeding 180°. This conclusion would imply that it interferes with the nutrition of the cornea or causes an objectionable amount of astigmatism or is followed by a greater percentage of septic cases than the smaller incision used in the capsulotomy operation.

With my enormous experience I can state that not one of these premises is based on fact. Those who advance this conclusion do not advance a single fact to support their premises. They say—this must follow or that must follow—but "this" and "that" do not follow when examined by hard facts. Our opponents say that we cannot do intracapsular extraction with a conjunctival flap. This is nonsense, we can do it with any flap or any incision provided it is large enough. Much is made, by the way, of the powerful nutritional influence of conjunctional flaps. I saw a dexterous operator do intracapsular extraction by a Czermak's incision. He subconjunctivally cut two-thirds or more of the sclero-cornea with scissors. I saw a number of such cases several days after operation. They demonstrated that the nutrition of the cornea does not depend on the conjunctiva as every case had extensive patches of starvation opacities which would never recover. These starvation patches do not follow when the incision does not exceed 180° of the sclero-cornea without a conjunctival flap. It is thus evident to me that the nutrition of the cornea for practical purposes is not through the conjunctiva.

Iridectomy.— It is also advanced against intracapsular extraction that we cannot do this operation without an iridectomy. This is not so, we can do it through an entire pupil uninfluenced by mydriatic just as well as with an iridectomy. We can go further, we can do it well in cases in which the iris is tied down to the lens by iritic adhesions. In this latter case if you extract by capsulotomy you will have violent iritis and its consequences in every or almost every case. You will thus see that our limitations are less than these of our opponents.

Vitreous Escape.—This is the great issue, our opponents would seem to have much less of this evil than formerly was the case, but on large figures reaching back into the nineties of last century they have to admit to 7%. A skilled operator by the intracapsular method should not have more. In intracapsular extraction with control of the eyelids as we do it, when vitreous escapes it should be of small amount. In my observation escape of under a third is not followed by sinister consequences. I think the capsulotomy operators will admit that when they have escape of vitreous it is considerable, as they do not control the pressure of the eyelids as we do. The consequences of escape of vitreous in these two operations are quite different. In the intracapsular we do not fear iritis or iridocyclitis as a consequence, our opponents have to admit that when vitreous escapes they have at once to close down leaving the capsule and a considerable amount of lens matter in the eye and that under such circumstances they have frequently a severe iritis or an iridocyclitis. Our opponents say that when vitreous escapes it is not renewed. How do they know? Why make such a statement in an offhand way when it is based on the absence of knowledge. The physiology and pathology of the eye are hardly in their infancy, we must admit that from birth to mature size the vitreous body has grown. This implies a physiological mechanism through which it has grown. The statement that vitreous is not renewed after escape implies that that mechanism has ceased to exist when the vitreous has reached mature size. How do they know? They do not know. I saw not long ago a horse breaker who had both lenses extracted in capsule fifteen years ago. In each eye there was considerable escape. I examined him. His vision in each eye was better than $\frac{6}{6}$ and there was no sign of degeneration. How does the above assertion fit in with such facts? The reverse could far more plausibly be held.

The Pupil.—In non-iridectomy cases, the pupil is as central in one operation as the other. In the case of iridectomy the pupil is more central in the old operation than in the intracapsular and occasionally much more so. If you use a mydriatic in the old operation after events you will observe that the pillars of your coloboma are practically always tied down to the after-cataract by adhesions though it may be comparatively free elsewhere. This is the cause of the key-hole pupil. The entire pupil contracts on the center, the iridectomy pupil (if there are no adhesions as in the intracapsular cases) contracts on the point of attachment of the iris to the ciliary region. This mechanically straightens out the keyhole into the shape of a U and of necessity draws up more or less the lower part of the pupil.

My ambition is to be able to do without iridectomy entirely. I hope to be able to accomplish this object by finding some drug or some method which will paralyze the orbicularis muscle for five or six days after operation. It is the contractions of the orbicularis which are the cause of the prolapse of iris. I hope other workers will devote thought and energy to this issue which I consider one of the most important on cataract extraction as it stands to-day. Among other things it will eliminate the necessity of an assistant.

Dressings.—It is advanced against us that we do not dress and inspect our cases often enough. We must remember that this is one of the most major operations of surgery. Iritis we do not have. The only complications are sepsis, choroidal hemorrhage and prolapse of iris. In my observation sepsis and choroidal hemorrhage defy treatment—such cases give indications and naturally are inspected. Prolapse of iris may give no indication and is much better left alone for ten or twelve days as interfering with it earlier may cause the patient to burst open the whole wound and has no other advantage.

Why should we reverse the canons of surgery by dressing and inspecting wounds daily? By doing so we are depriving the affected area of surgical rest—such daily dressings are meddlesome surgery.

The Assistant.—We are accused of requiring a skilled assistant. What general surgeon would listen to such an argument. We are also told that to be a perfect operation it must be such that any ophthalmic surgeon can do as well as any other. Does the general surgeon say that Cushing's procedure in dealing with a diseased hypophysis is bad because very few will attempt it? Does the general surgeon say that excision of the Gasserian ganglion is bad because very few will attempt it? Still, I hope that the day is not far distant when intracapsular extraction will be considerably simplified.

I recently visited Dr. Barraquer in Barcelona. He received me with the whole-hearted kindness and courtesy of a Spanish gentleman. He operated on a few cases with his erisiphake. It acted beautifully. He insisted that I should operate also to show him how I did the operation in India. Mine came out as easily and as perfectly as his—and in both cases with the minimum of violence. We were agreed that in the hands of the experts there was nothing to choose between them. Dr. Barraquer's instruments may not require as highly a skilled assistant as my method. On the other hand—it is a highly complicated apparatus with plenty of possibilities of going wrong at a critical moment in the hands of a man who has not thoroughly mastered its mechanism and whose fingers have not grown to act automatically.

The instrument requires a technique of its own. Those who have mastered my technique (I am confident) will have no difficulty in using it as a good deal of the technique is common to the two methods. They are complimentary to one another. The erisiphake is but in its infancy and we have yet to see if it will master certain classes of cases as well as the older intracapsular method, but in most cases I have no doubt it will act beautifully and be a simpler method to acquire skill in. I was immensely pleased to meet Dr. Barraquer, a whole-hearted believer in intracapsular extraction, and to see him use his instrument. It has in my opinion come to stay and will help to make matters move on.

I congratulate Dr. Barraquer on all the energy and zeal which he has devoted to making this method perfect. When Hulon's instrument came out, I tried to get one as the method appealed to me. Throughout the war we could get nothing of the kind done in England.

Indians.—It has been repeatedly advanced that what will succeed on Indians—an uncivilized people—will not succeed nor satisfy a civilized people such as the white races. Those who write thus seem to be unaware that Indians belong to the Aryan race to which we also belong, and that they were a highly civilized race long before Europeans were. You have only to read Hindu and Buddhistic philosophy to find this. As regards the whole range of surgery the people of India measure your worth by results and as much so as the people of Europe or America do. It is on this basis that litholopaxy supplanted lithotomy in the last two decades of the last century. It is on this basis that intracapsular extraction of cataract has got the upper hand over the capsulotomy method in India. To assume that you can cut or hack about Indians in any way you please and that they will recover shows gross ignorance. As a matter of fact they are not as good subjects for operation as Europeans. Their vegetarian diet I presume is the cause. This is best defined in the patient's liability to surgical shock. It is not uncommon in the West to see an operator spend one and a half to two or even three hours on an intra-abdominal operation and for the patient to recover as a matter of course. In an Indian if you expect a simpler operation to be successful you must not spend over an hour over it and if you do it in half an hour your death rate will not be nearly so large. The principle herein evolved is the same all down the line, cataract included. He has not anything like the same recuperative power as the European.

It is often advanced by implication that my facts are worthless because I am overworked and that by men who are not aware that cataract is but part of my work. I had once a distinguished member of the profession on a visit; when leaving he told me that he wondered how I got through the work, but he now understood. He said, "you are not overworked, you are not hustled, it is your organization that is the explanation, every one about you has got his job and knows it, and has got to do it, leaving what you want to yourself." After thirty years on the plains of India I do not look like a man who has been overworked.

As regards my facts, I have satisfied myself. I have published statistics of cases selected before operation which should satisfy the most fastidious. To publish the details of between 40,000 and 50,000 cases would make up a volume in itself, which I presume no one would read.

Those who have visited my clinic have seen everything, there was nothing concealed from them.

As regards the status of intracapsular extraction of to-day, views expressed in papers of the West are misleading and take too narrow a view of the outlook. It is a yellow peril, I think. I am not overstating the case when I say that close on 25,000 cataracts a year are done by the intracapsular method in India and that ten years hence we may have to add another ten thousand. Thus India will have a voice in the decision. It has come to live and dominate its opponent in the whole East, and in my opinion will be the operation the world over twenty years hence.

EPISCLERITIS—A NEW METHOD OF APPROACH.[1]

By Dr. H. L. SINSKEY, Dr. M. B. LEVIN, and Dr. B. SACKS, Baltimore, Md.

EPISCLERITIS is an inflammation of the episcleral or subconjunctival connective tissue with the formation of a small nodule or patch of violaceous hue, usually seen on the temporal side near the outer margin of the cornea. The nodule feels hard and sensitive as a rule, and is attached to the sclera, the ocular conjunctiva moving freely over it. The violet or purple color is due to the injected subconjunctival vessels. There is no tendency to ulceration or suppuration. After a time, usually a few weeks, the nodule disappears, as a rule to recur after weeks, months, or even years. Rarely the disease stops after one or two attacks. In other cases, soon after one nodule has been absorbed, another takes its place, a new nodule seldom developing at the site of a former one. The subjective symptoms are burning, itching, slight pain, lacrimation, photophobia, and often headache, usually about the forehead on the affected side. The course of the disease, because of its relapsing tendency, generally extends over a period of months or several years.

Fugacious periodic episcleritis is a name which was given by Fuchs to a variety of relapsing episcleritis occurring in gouty or rheumatic adults which appears in sudden attacks during which there develops one or more patches or episcleral congestion or œdema lasting several days, reappearing at intervals of several weeks or months, occasionally recurring in this fashion for years.

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[1] Paper read before the Ophthalmological Section of the Baltimore City Medical Society, December 1, 1920.

There is no unitary ætiology for the disease. Rheumatism, gout, tuberculosis, syphilis, menstrual disturbances, "enterogenous auto-intoxication," constant exposure to wind and rain, focal infection, and more recently protein hypersensitiveness (anaphylaxis) have been cited as predisposing factors.

In spite of the multiplicity of therapeutic measures which have been employed in this disease, many persistent cases remain which prove a bugbear to ophthalmologists. We wish to report a case of episcleritis in which no obvious ætiological agent was present. Prompted by the circumstance that the case had resisted all the usual forms of treatment, we studied the patient from the metabolic point of view and were rewarded by the finding of a means of causing the disappearance of her symptoms.

CASE REPORT

F. T. Female. Jewish. Age 36. Married. Housewife. Address, Baltimore, Md.

Complaint.—"Pain and distress in eye."

Family History.—Unimportant.

Past History.—General health has always been good. No cardio-respiratory, gastro-intestinal, genito-urinary, neuro-muscular, or locomotor symptoms.

Menstrual and Marital History—Menses began at age of sixteen. Usually regular. No menorrhagia or metrorrhagia. Married in 1903. Husband living and well. One daughter, aged 15, living and well. In 1914, patient had forceps delivery of living child who died at age of 5 days. A few days later patient developed an attack of erythema nodosum which lasted for one month. No arthritic symptoms were present.

Habits.—Unimportant. Average weight 140 lbs. No loss of weight.

Present Illness.—In 1916, the patient suddenly developed a severe attack of what she called "pink eye" involving the left eye, with pain radiating to the left temple and supraorbital region. No constitutional symptoms were present. The right eye was free of disease and has never been involved throughout the entire illness. Several days later a "small lump" appeared on the sclera of the affected eye just medial to the cornea. Patient went to one of the eye dispensaries where a diagnosis of episcleritis was made and local treatment instituted. When no improvement occurred, she was sent to an internist for a general study. General physical examination at that time was negative except for moderate pyorrhea and four alveolar abscesses. Following the advice of the internist, the diseased teeth were extracted and the pyorrhea treated. Because the patient experienced no relief from her symptoms following this treatment, she consulted another oculist who prescribed local measures and vaccine therapy. In spite of a course of treatment lasting six months, the symptoms did not clear up. A laryngologist was then consulted to search for further foci of infection. He found the tonsils diseased and performed a tonsillectomy. For the first time since the onset of the disease one year before the symptoms all disappeared, only to return however, ten days later. She then consulted a third oculist who prescribed local treatment which again failed to result in any amelioration of her symptoms. She was then sent to a second internist who diagnosed chronic appendicitis and advised removal of the appendix, but the patient would not consent to this operation. A fourth oculist was now consulted. He prescribed in addition to local measures the oral administration of a colorless solution in ten drop doses (probably potassium iodide). He also advised the elimination of pastries, candies, and white bread from her diet. After being under treatment for two months, the patient was markedly relieved and discharged as cured. The patient states that her eye looked entirely normal at that time. After a period of freedom from symptoms lasting four months, the episcleritis returned in fully developed form. She now visited another dispensary where again a thorough study of her case was made. The general physical examination supplemented by roentgenography of the teeth and paranasal sinuses was negative. The oral administration of a drug which caused nausea, vomiting, ringing in the ears, and loss of appetite resulted in an improvement of the ocular symptoms, which returned, however, in a few days. The patient now became disheartened, and sought no further medical advice until five months later, by which time her pain had become so severe that it kept her awake at night. She then consulted one of us (H. L. S.), complaining of severe pain in the left eye radiating to the left temple and supra-orbital region, and marked itching and burning, lacrimation and photophobia. The previous diagnosis of episcleritis was confirmed. A third general review was made and, except for a roentgenological report of slight clouding of all the paranasal sinuses, the findings were negative. An operation was performed, but no disease of the sinuses was found. An improvement followed this operation, but it lasted for only twelve days. Vaccine therapy was again tried with no resulting benefit.

The patient was admitted to the Hebrew Hospital, Baltimore, Md., November 21, 1919.

Physical Examination—Moderately obese woman. Acra not prominent. Skin of normal texture, free of eruption. Normal distribution of hair. No fever. No skull, sinus or mastoid tenderness. Ear drums normal. Right eye negative. Left eye Palpebral fissure narrower than on right side. Extraocular structures œdematous. Moderate ptosis and ectropion. The skin of both lids is hyperæmic, moist, œdematous, and shows fissuring and desquamation. Excessive lacrimation is present. The ocular and palpebral conjunctiva is œdematous and injected, pink in color. Slight pericorneal injection. In the episcleral tissue there is a small hyperæmic nodule about 2.5*mm* in diameter the outer margin of which is 2*mm* to the nasal side of the sclero-corneal junction at the equator. Radiating from this nodule, there are numerous fine injected vessels. The cornea shows a few nebulæ. The pupil is completely dilated by a mydriatic. Ocular tension normal in both eyes. Ophthalmoscopic examination in both eyes negative. Vision in right eye $\frac{20}{20}$, left eye $\frac{20}{100}$. Both eyes hyperopic. No nasal obstruction or evidence of sinus infection. Several teeth missing. Gums and remaining teeth healthy. Tonsils cleanly removed, pharynx not injected. No general glandular enlargement. No struma. No fine tremor of fingers. Heart and lungs negative. B. P.$\frac{130}{76}$. Genitalia essentially negative. Extremities and spine negative. Deep reflexes active. Plantar response normal.

Laboratory Examinations:—

Blood Count.—R. B. C. 4,670,000 per cu. *mm.* Hæmoglobin, 80% (Sahli). W. B. C. 10,400 per cu. *mm.*

Differential Count.—Polymorphonuclear Neutrophile Leucocytes, 68.3%. Eosinophile, 0. Basophile, 0. Lymphocytes, 27.7%. Large Mononuclears, 1.5%. Transitionals, 2.5%.

No abnormal red or white cells. Platelets normal in size and number.

Urine.—Clear, amber, acid reaction. Sp. Gravity 1.012 to 1.022. Trace of albumen. Sugar—negative. Microscopic Examination—No casts or red blood cells. Occasional white blood cell.

Stool.—Negative.

Blood Wassermann.—Negative.

Phenolsulphonephthalein test.—1cc injected intramuscularly.

1st hour	42%
2nd hour	20%
Total	62%

Course in Hospital.—Immediately upon admission, metabolic studies were instituted. It was decided to investigate the carbohydrate, fat, and nitrogen metabolism, and to study the effects of diets rich in particular types of food upon the ocular condition. Special diets were planned to meet these requirements, and the blood and urine chemistry studied simultaneously with careful observations of the changes in the diseased eye. She was kept for three days on each diet. On the third day of each series, blood was withdrawn from a vein in the forearm, and an estimation of the blood sugar, blood urea and non-protein nitrogen made. The twenty-four hour specimen of urine voided on the third day was examined routinely and for total nitrogen and urea nitrogen, quantitatively.

Upon admission, November 21, 1919, she was placed upon full diet. There was no significant change in the symptoms. On November 24th, she was placed upon a diet low in protein and fat, but rich in carbohydrate in the form of sugar, potatoes, cereals, and bread. Her symptoms became immediately more pronounced, the episcleral congestion increased as did the œdema of the lids and periocular tissues, the ptosis and ectropion became more marked, and the lacrimation, photophobia, pain, burning, itching, and headache were all aggravated. She was taken off this diet on November 27th and placed upon a diet similarly rich in carbohydrate but chiefly of the vegetable type, the carbohydrate in the form previously used being excluded as far as possible. The symptoms slowly began to improve, and continued to improve after this diet was changed on November 30th to one still high in carbohydrate, this time in the form of fruits predominantly. In order to show that the aggravation of symptoms which occurred when the patient took large amounts of saccharine and starchy foods could be reproduced at will, it was decided on the second of December to give again a diet rich in these foods. The improvement noted on the previous diets ceased promptly and the symptoms again became definitely worse. This time she developed in addition a boil on the left forearm which lasted for ten days. On the sixth of December she was placed upon a diet rich in fat, low in carbohydrate and protein. The symptoms did not improve on this régime as on previous occasions when the intake of carbohydrate had been reduced. On December 9th, she was placed on a diet very low in carbohydrate with a moderate amount of fat, and high protein content chiefly in the form of cheese, fish, and eggs. A slight improvement was observed. This improvement continued when the patient's diet was changed to one rich in protein in the form of meat, and when the diet

TABLE OF BLOOD AND URINE CHEMISTRY.

Date	*Diet*	*Blood Sugar %*	*Blood Urea mgm. per 100cc*	*Non-Protein Nitrogen mgm. per 100cc*	*Sugar (Urine)*	*Total Nitrogen (Urine)*	*Urea (Urine)*	*Nitrogen Intake*
11/23/19—	Full Diet	0.14 %	35	38	Neg.	12.0 gms.	20.1 gms.	15.2 gms.
11/26/19—	High Carbohydrate (Bread, Potato, etc.)	0.14	31.5	31	Neg.	6.5 gms.	29.2 gms.	10.1 gms.
11/29/19—	High Carbohydrate (Vegetables)	0.128	30	29	Neg.	7.1 gms.	10.1 gms.	9.5 gms.
12/ 1/19—	High Carbohydrate (Fruit)	0.14	38.4	33	Neg.	9.2 gms.	12.5 gms.	10.2 gms.
12/ 5/19—	High Carbohydrate (Bread, Potato, etc.)	0.13	48	40	Neg.	8.7 gms.	11.0 gms.	10.1 gms.
12/ 8/19—	High Fat	0.126	30	28	Neg.	6.0 gms.	10.3 gms.	9.6 gms.
12/11/19—	High Protein (Cheese, Fish, Eggs)	0.135	45	42	Neg.	14.3 gms.	22.9 gms.	20.5 gms.
12/15/19—	High Protein (Meats)	0.152	36	30	Neg.	6.5 gms.	25.5 gms.	25.2 gms.
12/17/19—	High Purin	0.14	40	39	Neg.	12.2 gms.	18.7 gms.	18.0 gms.
12/18/19—	Fruit Juices	0.135	24	30	Neg.	4.5 gms.	6.0 gms.	3.0 gms.
12/19/19—	Full Diet	0.14	35	37	Neg.	10.4 gms.	18.9 gms.	15.2 gms.

> contained large amounts of purin derivatives such as are present in liver, spleen, sweetbreads, kidney, and brain. On the 18th of December, the patient received nothing but fruit juices, and the improvement still continued. On the following day the patient was again placed upon full diet and the symptoms again increased. On the 20th of December, the patient was discharged from the hospital.

The quantitative studies of the urine and blood chemistry revealed findings of very little material assistance, as can be seen by a review of the table given above. The nitrogen balance was essentially normal and the blood sugar a little higher than it should be three hours after a meal. The qualitative studies with the various diets were more illuminating. From the observations recorded, it was concluded that the ingestion of large amounts of carbohydrate of the sugar and starchy types and to a lesser degree, of excessive amounts of fat stood in some causal relationship to the patient's eye condition.

These facts having been determined, she was given a carefully arranged diet consisting of moderate amounts of protein, a restricted amount of fat, and a moderate amount of carbohydrate of the vegetable and fruit type. She was particularly warned against taking more than minimal amounts of carbohydrate in the form of potatoes, sugars, syrups, cereals, and bread. The symptoms began to clear up rapidly and two weeks after she left the hospital the episcleral node and all the subjective symptoms disappeared. Two weeks later the ectropion receded. The ptosis of the upper lid improved more slowly and is still present to a slight degree. There has been no full-blown recurrence since the subsidence of symptoms over a year and a half ago. For the most part the patient has carefully observed the restrictions of her diet. On several occasions when she has been lax in her diet, she has developed a slight recurrence of symptoms, namely slight episcleral congestion and some pain and itching. These symptoms promptly disappeared when the offending foods were again excluded. *It has further been possible to cause the reappearance and subsidence of the ocular symptoms by the feeding and withdrawal of the forbidden foods.*

It is interesting to review the patient's history for the purpose of explaining the brief remissions which she experienced during the course of her illness before admission to the hospital. Following a tonsillectomy on one occasion, and following a paranasal sinus operation on another, she experienced great relief from her symptoms for a period of a number of days (ten and twelve days respectively). It is reasonable to assume that the restriction of the offending foods during the post-operative period when the patient ate very little brought about the improvement in the ocular condition. In a third instance the patient was given a drug which caused nausea, vomiting, and anorexia, presumably one of the salicylates. Here again the omission of the foods in question may be held to have been responsible for the patient's improvement. In a fourth instance, the physician empirically forbade the ingestion of pastries, candies, and white bread. In retrospect, it is clear why when these instructions were followed the patient experienced marked relief from her symptoms.

It is of interest to speculate in what relation the ingestion of carbohydrate of special type, viz., in form of bread, potato, syrups, sugar, cereals, stand to the ocular lesion. At least three explanations are possible. In the first place it may be assumed that the carbohydrate itself after absorption into the blood stream is directly responsible for the production of the symptoms. If this were true, it would have to be assumed that in the digestion of the offending foods carbohydrates are absorbed different from those absorbed during the digestion of fruits and vegetables. If the physiology of the intestinal digestion of carbohydrate foods is considered, it becomes evident that the ultimate absorption products of the various types of carbohydrate foods do not vary from each other in any essential way.

A second possibility is that the protein element in carbohydrate foods is responsible for the symptoms. Thus it is conceivable that the protein of potato, for example, is the cause of the ocular symptoms as an anaphylactic phenomenon. If this were true, however, it would not be possible to explain how the ingestion of large amounts of sugar in pure form with the omission of the other offending foods could bring about the patient's symptoms. Moreover, cutaneous hypersensitiveness tests were carried out with some sixty proteins prepared from the commoner foods, including those in the diets given the patient. In no instance was a positive reaction obtained. It is doubtful, therefore, that the protein fraction of the offending foods is responsible for the symptoms.

A third possibility remains, namely that the ingestion of the offending carbohydrate foods in some way deranges intestinal digestion and causes the absorption of toxic substances which in some way are related to the production of the ocular condition. It must be further pointed out that the ingestion of more than moderate amounts of fat causes an increase in the patient's symptoms. This fact lends greater cogency to the assumption that the individual foods in question were not directly responsible for the production of ocular lesion, but that they acted in our patient by deranging gastro-intestinal digestion in some way. Of course, it realized that in attempting to explain how the offending foods produced their mischief in our patient, that only unproven hypotheses can be offered, and that a theory of gastro-intestinal intoxication or a disturbance of the intermediary metabolism can only be a speculation at the best.

SUMMARY.

A case of episcleritis resisting the usual forms of treatment is presented, and is concluded to be of metabolic origin. After omission from the patient's diet of carbohydrate, in the form of cereals, potato, bread, and sugar, and reduction of the intake of fat a disappearance of symptoms resulted. That the relation of the ingestion of certain foods to the ocular condition is not an accidental one is evident from the fact that the patient's symptoms can be experimentally reproduced by the ingestion of the offending foods. It is suggested that in the diagnostic study and therapy of cases of episcleritis of obscure etiology, dietetic factors be taken into consideration.

A CASE OF KELOID OF THE CORNEA.[1]

By Dr. H. D. LAMB, St. Louis, Mo.

(*With two illustrations on Text-Plate XXV.*)

THE subject in this case is a little girl now six years of age who lost all sight of both eyes at the age of a few weeks as the result of a birth infection. The inflammation at that time terminated apparently in a total staphyloma of each cornea.

On entering the Missouri School for the Blind last fall the patient showed what appeared to be a rather prominent opaque growth covering almost the entire surface of the left cornea. Its shape was roughly that of a flat cone appearing at its center or thickest part to project forwards about 4*mm* from the anterior corneal surface. Some superficial blood vessels were present. The color of this growth was white with a yellow tinge; the surface absolutely smooth and the consistency fairly hard. Tension of each eyeball +++, and the vision nil.

This prominence projecting between the eyelids constantly caused a rather marked irritation of both eyelids and eyeball. This being an additional reason for its removal enucleation was done. Eyeball fixed in formalin was later cut in various portions, the anterior third imbedded in celloidin and meridianal sections from it stained with hæmotoxylin and eosin.

Microscopic Findings.—Under the microscope the corneal prominence is found to be due to an excessive thickening in the original staphyloma of the cornea. This thickening is made up of many very broad homogeneous bundles or lamellæ of connective tissue. These lamellæ greatly resemble those forming the substantia propria of the normal cornea except that they are much broader. The arrangement of these fibrous bundles is very compact and in general they run parallel to the external surface, although in several places they appear quite irregular and course very obliquely.

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[1] Read before the St. Louis Ophthalmic Society, May 27, 1921.

The fixed cells belonging to these broad lamellæ are present in moderate numbers, are situated in the spaces between the lamellæ and stain quite clearly and strongly. The latter is due to the cell-bodies taking the stain well, showing the cytoplasm to be of a fine granular or reticular structure. The form of these cells is generally spindle-shaped but there are also many flat stellate ones. The nuclei of these cells stain weakly on surface view and are generally flattened ellipsoid-like particles. There are only occasional wandering cells present.

The most posterior of the fibrous lamellæ on each side are seen to be very thin (at least compared to those lying anteriorly); are pressed very tightly together and contain in their midst a profuse number of small flat stellate cells, whose cytoplasm stains unusually distinctly.

A few small capillaries are present between the lamellæ or bundles, but there are no vessels of larger size.

An area represented by more than the middle third of the posterior corneal surface is found to be necrotic, the necrosis extending forwards through about one half the thickness of the entire corneal mass. Much of the necrotic tissue has disintegrated and more has further liquified and disappeared leaving many open spaces devoid of solid tissue. This is not to be wondered at considering the meager blood-supply in cicatricial tissue, to which is added the layers of the new growth to be nourished.

One or two layers of heavily pigmented epithelial cells from the posterior surface of the iris extend across the internal surface of the cornea, being rather broken up behind the necrotic area. Cystic spaces of large and small sizes are seen here and there between the two layers of epithelial cells.

At one side of the cornea there are posteriorly a number of quite normal corneal lamellæ, behind and adherent to which there is a thin layer of iris-stroma remains. There is no line of demarcation between the broad lamellæ of the new growth and those of the adjacent normal cornea, the one grades fairly gradually into the other.

The covering epithelium is similar to the normal corneal one, although it contains more layers of the intermediate polygonal cells; superficially there is a very thin keratinized layer.

Between the anterior epithelium and the anterior surface of the growth there lies a narrow layer of thin but fairly dense bundles of fibrous tissue furnished with a large number of oval nuclei and containing many capillaries and small blood vessels. This appears to be the only part in the corneal mass that remains of the original staphylomatous corneal scar-tissue. A fairly sharp line of demarcation exists between these narrow scar-tissue bands and the main mass of broad connective-tissue bundles. Toward the epithelium this tissue forms a large number of rather broad but shallow papillæ except on the side where normal cornea is present, as described above.

As is customary in staphyloma of the cornea the ciliary body and choroid show much atrophy and the retina marked degeneration.

It is seen frequently in sections of old staphylomatous corneæ that the corneæ show a thickness greater than that normally found. This would mean a thickness still greater than that of the ordinary staphylomatous cornea which is comparatively thin as a rule, due to the iris healing into it posteriorly. Such excessive thickening is always found microscopically to be due to the presence of fibrous-tissue lamellæ similar to, but much broader and thicker than those of the normal cornea. The arrangement of these lamellæ is in general parallel to the external surface although many places may be found where their direction is more or less oblique. I have in hand now sections from two eyes showing these changes in a distinct degree although nothing like as marked as in the one under discussion. Now these broad lamellæ are certainly not characteristic of the ordinary corneal scar. We are told by Parsons (1) that in the very young the thickness and arrangement of the fibrous lamellæ forming the staphylomatous corneal scar approach closely in time to those of normal cornea. However in our case these lamellæ are very much thicker than those of the normal cornea. This cannot then be called exactly a hyperplastic or hypertrophic scar. We cannot call it a fibroma either although externally it did appear so. Microscopically, however, it is too intimately associated with the original staphylomatous corneal scar-tissue, indeed it seems to have originated from or within it along its entire extent. However the description of a typical keloid, as given by Ribbert (2), Kaufmann (3), Ewing (4) and others, certainly fits accurately the structure of the corneal thickening in our case. The first two writers also differentiate between a keloid and a hypertrophic scar.

Another case in the Missouri School for the Blind appears on inspection to have the same sort of growth as the one just described. This second case gives a history of having had these eye-changes present from birth. The subject is a young man of 18 years whose left eye shows a grayish-white flat prominence extending from a large leucoma adherens in the lower part of the cornea. The size of this growth is about 7*mm* broad by 6*mm* high projecting anteriorly for about 3*mm* from the corneal surface, and protruding between the open eyelids. Vision in this eye is ability to count fingers at three feet. The right eye from the history is a congenital phthisis bulbi; vision nil in the right eye.

There have been but few true corneal-fibromata reported in the literature. Capellini (5) in 1901 reviewed the published cases up to that time of true fibromata of the cornea, five in all; one of these cases Parsons (1) calls cicatricial fibroma. Capellini (5) omitted one case of true fibroma of the cornea described by Benson (7) in 1890. Capellini (5) added the description of two other corneal-fibromata both of which Parson (1) thinks are more probably types of hyperplastic scars. Of the latter Capellini (5) reviews five cases under the name of cicatricial fibroma or keloid. Parsons (1) says that these latter are by no means infrequently met with. Since the report of Capellini (5) there have been published up to the present but one more case of true fibroma of the cornea (at least that is all I could find after careful searching), making six in all.

Capellini (5) prepared a very concise and graphic tabularization of the essential points in the cases he reviewed. Of the true fibromata in this classification I will quote briefly from this author:

First case reported by Quaglino and Gaita in 1879. A man of 48 years—in the left eye had had a conjunctivitis and previous corneal ulcer, ending in leucoma and corneal opacities—tumor present, for about three months, in the under outer segment of the cornea, spherical, size of a grain of corn, stalked and of mother-of-pearl whiteness. Histological examination showed epithelium similar to that of the cornea, crowded bundles of connective-tissue fibers crossing each other in different directions with intermingled connective-tissue cells. Eight months after removal of this growth it returned, having the same characteristics. Complete healing followed second removal.

Second case reported by Falchi in 1884. A man of 28 years in his left eye had frequently recurring ophthalmia and pericorneal phlyctenules—tumor present for seven months. This was located in the under half of the cornea not reaching the limbus, greatest diameter 6.7*mm*, smallest 3.4*mm*, egg-shaped, smooth surface, pale rose-red color. Histologically the growth showed epithelium with mucous degeneration covering lamellated connective-tissue similar to the corneal tissue; the layers paralell, oblique—concentric—not many vessels. This was excised going to Descemet's membrane.

Third case reported by Benson (6) in 1887. A girl of 19 years—in left eye growth had been present in previous three years. There had been no preceding inflammation of the eye nor any cause found that might lead to such a growth. Tumor densely white and opaque was present near the center of cornea, round, 4*mm* in diameter, raised above the surface of the surrounding cornea to the extent of nearly 1*mm*, while the normal corneal tissue under the growth remained transparent.

Histologically—epithelium and connective tissue in layers similar to that of the cornea. This growth returned at the same spot three months after its excision, but was much smaller, less elevated than the previous one and with square edges instead of circular as before; microscopic findings the same.

Fourth case reported by Gallenga in 1896. A girl of 4 years had had an ulcerative keratitis in the right eye during the first year, accompanying measles: trachoma next ending in an almost total opaque irido-corneal staphyloma—staphylotomy with incomplete underflaps and removal of part of the staphyloma—after a year return of the staphyloma with elevation in lower part. This elevation involved the lower two thirds of the cornea, glistening white, sinewy. Microscopically—many-layered fibrous connective-tissue, with vessels—few in number, surrounded by accumulations of cells.

Benson's (7) second case of true corneal fibroma overlooked by Capellini (5) was a man of 72 years whose left eye had been blind for years with glaucoma. Cornea hazy, and adherent to its surface above the center was a smooth nearly circular biconvex-lens-shaped growth of a lusterless gray color. This growth was about 5*mm* in its longest diameter, 2*mm* deep at its thickest part and attached by about 2 or 3*mm* of its thin edge to the corneal surface, which it overhung. Histological findings—growth surrounded by corneal epithelium, consisted of fibrous tissue, which at the end most remote from the cornea resembled corneal tissue.

Another case of true corneal fibroma was described by Rogman (8) in 1901. This was a woman of 30 years who showed at the center of the right cornea a little growth the size of the head of a large pin—semi-transparent, prominent—a little grayish. It had been noticed for about three months: was preceded by no scar or other apparent cause. Microscopically the tumor was seen to be composed of embryonic spindle-shaped cells, separated from each other and surrounded by fibrils of connective tissue.

The cases just described from the literature have been approved by Parsons (1) as being true corneal fibromata. In the case of three, or one half, of these the fibroma apparently proceeded from previous corneal scar-tissue. Therefore it might be said with some justification that these three growths are modified hypertrophic corneal scars. It is not impossible in the case of the other three that the fibrous growths may have arisen on a very small non-apparent amount of corneal scar-tissue.

The history in Gallenga's case is somewhat like the one reported in this paper; judging solely from Capellini's abstract of the description of this case, I cannot see why it is not as much a hypertrophied corneal scar as my own case.

The description of microscopical findings in most of these true corneal fibromata give the substantia propria as composed of many-layered connective tissue similar to that of the cornea. Tissue of such appearance might easily be cicatricial tissue.

Consequently consideration of the arrangement of the connective tissue of corneal growths alone is not sufficient to establish or deny a diagnosis of fibroma. Consideration of other characteristics of the growth seem more important, as in the case described by Quaglino-Gaita, in the two cases of Benson and the one of Rogman. The prominent or pedicled condition of these three connective-tissue corneal growths would justify strongly the designation of them as true corneal fibromata.

The principal characteristics of the five cases of cicatricial fibroma of the cornea reviewed by Capellini (5), and the two described by him which Parsons (1) thinks are forms of cicatricial fibroma, are that the growth is more in the form of a corneal thickening. This thickening can occur in a variety of forms of connective-tissue bundles of different thicknesses and regularity, with an infiltration of greater or less degree and vascularized to a large or small extent. In none of these did I find the characteristics of a typical keloid as in my own case.

I carefully searched the literature from the time of Capellini's (5) writing for further reports of connective tissue growths of the cornea. I give below what few cases I could find but the descriptions in all cases are so meager that it is impossible to classify them, *i. e.*, as true fibroma or cicatricial fibroma.

Mann (9) reported a case of congenital fibroma of the cornea in 1909 discovered in the right eye of a girl of 19 years. Tumor was pinkish, vascular, and extended from just above the limbus to below the center of the cornea, circular, 8*mm* in diameter and 3 to 4*mm* in thickness at its center. This is the only case of cogenital fibroma in the literature, with the possible exception of one reported by Scott and Story (10).

Schenck (11) described an interesting case of corneal fibroma in 1916. There was present a pterygium on the temporal side of right eye and the growth was located at its apex, midway between the limbus and pupil. The growth was about the size of a large split pea.

Levitzkaia's (12) case reported in 1915 was abstracted very briefly in the *Annales d'Oculistique* of 1917. This growth was very large, present in a two-year-old baby, developed rapidly from no known cause, in consistency partly hard and partly soft; elastic tissue elements were noted in it.

Ball (13) mentions having seen symmetrical growths of the corneæ which proved on histological examination to be fibromata.

Conclusion.—It is surprising how few fibromata of the cornea are found in the literature, particularly when there occur so many corneal disturbances resulting in considerable irritation and formation of new fibrous tissue. According to Capellini's and Parson's findings in the literature one is justified in reporting even cases of hyperplastic and hypertrophic corneal scars.

Keloid according to the authorities in pathology has a characteristic histology; it would seem most accurate therefore to designate as keloid those corneal growths having such structure. Of course the keloid is considered as a form of scar tissue, but it must be conceded that it is a distinct definite form.

I wish to express my indebtedness to Dr. J. W. Charles, Oculist at the Missouri School for the Blind, for permitting me to present this case.

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LIPÆMIA RETINALIS.[1]

By Dr. W. F. HARDY, St. Louis, Mo.

THERE is small virtue in reporting but a single case of any disease. In this report, however, there are extenuating circumstances; firstly, because there are but few authentic cases of lipæmia retinalis in recorded literature, and secondly, because a complete metabolic study was made, which I believe has not been done before.[2] Little of immediate practical value can be gotten from a report such as this. It is interesting and ususual, and these two qualities always act as a stimulus to observation. Furthermore, it is virtually an obligation on our part to furnish case reports, especially in rare cases, in order that a definite and true clinical picture be established.

The first case of lipæmia retinalis was reported by Heyl before this society in 1880, under the title of "Intraocular Lipæmia." Reports then followed by Hale-White, 1903, Fraser, 1903, Reis, 1903, Turney and Dudgeon, 1906, Heine, 1906, Hertel, 1909, Köllner, 1912, Darling, 1912, Foster Moore, 1915 (two cases), Cohen, 1921, and the present report. Lipæmia, as has been pointed out by others, occurs in pregnancy, chronic alcoholism, diseases of the liver, nephritis, malaria, tuberculosis, cholera, and phosphorus poisoning. The most marked instances are met, however, in diabetes. Lipæmia in diabetes is an old observation having been noted by Mariet of Edinburgh in 1799. Fat in normal blood varies from 1.00 to 3.25 parts per 1000 of blood. Hoppe-Seyler advanced the idea that lipæmia in diabetes represented a physiological phenomenon due to the fact that digestion is continuous, the result of abnormal ingestion of food. This has been disproved by Nauyn and by Ebstein. Lipæmia above the normal limits is now generally looked upon as a pathological process. The amount of blood fat present before lipæmia retinalis can be observed must be considerable, most probably in the neighborhood of 10%. In Fraser's case it amounted to 16.5%, in Reis's case 18.1%, and in Köllner's case to 26.25% with 2.16% of cholesterin. These high figures must be accepted with some mental reservation. A pathological lipæmia is not rare in diabetes, in fact, all the severe cases show an increased fat content in the blood.

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[1] Read at the meeting of the American Ophthalmological Society, Swampscott, Mass., June 14, 1921.

[2] This was written before Martin Cohen's report of a case of lipæmia retinalis with hypotomy appeared in the Arch. of Ophthalmology, May, 1921.

Hale-White did not think lipæmia retinalis an extremely rare condition. In the report of his case he stated that he knew of at least one other patient in Guy's Hospital in which this condition was observed. This is not the opinion of others, and many keen observers have never met with a single case. A search through the Medicus, from Foster Moore's report in 1915 to the present, did not reveal any reference.

CLINICAL ABSTRACT OF CASE HISTORY.

E. C., age 29, white, male. Entered Barnes Hospital Feb. 9, 1921.

History.—Comes complaining of an eruption over arms and legs, especially at joints. Some weakness and polyuria. Loss of weight.

Family History.—Negative.

Laboratory Findings:

Urine.—On entrance Sp. Gr. 1028. Acetone and diacetic acid strongly positive—6 hour output—1560*cc.*, Sugar 43.3 gms. Alb. trace.

Blood.—R. B. C. 4,400,000, W. B. C. 8,250. Hb. 70–80%. Differential, normal proportion except for increase in lymphocytes to 35%. P. S. P. 63% in two hours. Wassermann four plus both antigens. Blood sugar .278 *mgm.* per 100*cc.* Plasma CO_2 vol. % 34.3. Quantitative urine showed 5215*cc* output in 24 hours. Sugar 123.2*gms.* $FeCl_3$ four plus. NH_3 2.96*mgm.* Total N 13.46*mgm.* Creatinine 2.08*mgm.* Blood serum showed marked lipæmia. Serum a creamy color. Blood cholesterol show 780*mgm* per 100*cc.* (Blood control about 200*mgms.*)

2/10/21. Fat estimation (Bloor's method) 9.50%.

2/16/21. *Biopsy* microscopical report of skin lesions.
Diagnosis, xanthoma.

In the two sections which showed the yellow nodule there is an abundance of fibrous tissue in the midst of which are large cells. These cells are oval or polygonal and have vesicular nuclei which are round or oval. Sudan III shows the presence of fat in large quantities in the corium and subcutaneous tissue.

Course in Hospital and Treatment. Patient placed on a diet of about 60*gms* of carbohydrates and thrice cooked food for six days. Given 160*gr* sodium bicarb. by mouth in five hours. February 10, 1921, films of teeth showed abscessed tooth which was later extracted. Photos were taken to show skin lesion. Blood plasm CO_2 vol. % 46.

2/10/21. Eye consultation—Dr. Hardy—"Vessels appear as if filled with an emulsion. Evidence of a lipæmia. No areas of retinitis or hemorrhage. Media clear."

Patient's lesions were gradually disappearing during stay until almost absent at time of leaving.

2/16/21. Another complete blood fat done and showed 2.9% fat.

Patient had ulcerated tooth pulled and two furuncles opened.

Lumbar puncture thought inadvisable due to furuncles. Was discharged March 10, 1921, after receiving one dose of arsphenamine. Further treatment in skin clinic.

Hale-White contended that the term lipæmia is not strictly correct, "for the turbidity is not entirely due to fat globules, indeed they may be absent when the turbidity is marked, and that then, in addition to a precipitated proteid there is present a substance which although allied to fats is not a true fat." Futschner previously advanced a similar view. However, their opinions were based to a large extent on the fact that osmic acid did not stain as is usually expected of it, or else did so very poorly. Scharlach R was found by Turney and Dudgeon to impart its stain to the minute globules. These observers stained film preparations with Scharlach R and were able to demonstrate large numbers of fat droplets of all sizes. They laid emphasis on the point that Scharlach R and Sudan III gave excellent fat staining whereas osmic acid failed to stain satisfactorily. This probably gave rise to Hale-White's opinion that the substance in the blood was not true fat. With Turney and Dudgeon unsatisfactory results only were gotten with Busch's osmic acid preparation and no fat could be demonstrated in red and white corpuscles by any method.

The color of the retinal vessels as described by Heyl and others was that of a light salmon. In my case the color was more of grayish white likened by me at the time of observation to the color of malted milk. Possibly the amount of retinal pigment present has a bearing on this point. Differences in background probably give rise to different color impressions. Heyl's case was examined by gaslight, the present case with an electric ophthalmoscope. In my case the retinal vessels in no wise resembled normal vessels either in size or shape. The impression gained was that of looking at *flat* ribbons twice the width of normal veins, filled with malted milk. Possibly only an American, familiar with soda fountain beverages, can appreciate this simile; therefore it may be better to say that such an appearance is best described as a flat toned grayish white, the pure milk white being toned down by the admixture of a darker substance. I failed to be impressed with a salmon pink color which has been the color description in the majority of the recorded cases.

The colored drawing of Hale-White's case while no doubt an excellent likeness, because done by Head, would not serve as a good representation of the fundus picture in the case observed by me. The picture accompanying Darling's article likewise inadequately depicts the fundus picture of my case. I am led to believe that the picture varies in different cases, due to the amount of fat in the blood and the pigmentation of the fundus. In some of the recorded cases the patients were quite blonde with thin retinal pigment. In the illustrations of Hale-White, Darling, and of Köllner the suggestion of rotundity of the vessels still remains. Unfortunately in the present case no drawing was made but the most striking feature next to the color of the vessels was the impression of flatness or ribbon-like character of the veins and arteries which were indistinguishable one from the other and absolutely devoid of the light streak.

In but two of the reports (Hale-White's and the present one) was there an observation of the disappearance of the fundus picture and a return to normal appearance. With a better-ment in the general condition the fundus picture returned to normal in two months in Hale-White's case. In the present case the return to normal appearance was much more rapid, due to the modern energetic methods in bringing about a sugar free state and the combating of acidosis. The fat in the blood steadily and rapidly declined with the general improvement. The fundus picture returned to normal in two weeks.

With reference to the disappearance of the fat in the blood shortly before death (which has been noted) Turney and Dudgeon suggest that this is probably to be regarded as a vital phenomenon conditioned possibly by the febrile state of the last few days of the patient's life. A relation between acidosis and lipæmia seems substantiated which is not surprising inasmuch as marked instances of both conditions occur only in severe cases of diabetes.

According to Stitt, in plasma CO_2 determinations the following findings will serve as a guide to acidosis: 80–53 normal; 53–40 mild acidosis, no symptoms; 40–30 moderate to severe acidosis, symptoms present; below 30 severe acidosis, symtoms of acid intoxication will be present. These figures would indicate only a moderate acidosis in the case under consideration.

I think it can be stated with certainty that lipæmia retinalis of itself produces no pathological changes in the eye. Sight must not be lost of the fact that the underlying condition, diabetes, may produce retinal nerve and lens changes. So far as I know retinal changes have not been observed[1] but retrobulbar neuritis was noted by Reis and lens changes by Heyl. Hypotony was noted by Heine, Hertel, and Cohen but was not present in my case. Hypotony is occasionally met with in diabetic coma but its association with lipæmia is casual.

There has been considerable speculation as to why the veins and arteries appear alike in lipæmia retinalis. From Heyl to Moore nearly every contributor has had an explanation or offered a suggestion.

Heyl's explanation of the width of the vessels was based upon the supposition that in health the visible part of the blood in the vessels comprises the axial stream consisting of corpuscles whereas the peripheral part of the current is invisible plasma. In lipæmia, the plasma becomes opaque and hence visible, consequently the vessel appears double its usual caliber. With regard to the fundus picture R. Foster Moore explains it in this manner. "(1) The ground glass effect of the opaque plasma does away with the central light streak seen in normal retinal vessels; as a consequence of which the cylindrical contour is lost and the vessels have the appearance of flat bands or ribbons as is seen in normal choroidal vessels. (2) The color of the retinal vessels in lipæmia, where the salmon tint is moderately saturated, is almost exactly that of normal choroidal vessels. (3) In both instances there is the difficulty of distinguishing arteries from veins. It is probable, therefore, that the marked change in color of the retinal vessels is due entirely to the condition of the plasma and does not imply a change in the blood pigment." This last statement is undoubtedly true as the red cell count and percentage of hæmoglobin have been little below normal limits in most instances.[1] In the present case the blood in the centrifugal tube was a port wine color filling half the tube, with the upper half creamy in color and consisting for a great part of fat.

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[1] Cohen noted several small retinal hemorrhages in one eye.

I wish to express my thanks to Dr. Kudner for his assistance in furnishing clinical and laboratory data and to Prof. Shaffer of the Washington University Medical School for making the fat and cholesterol estimations.

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THE PHYSIOLOGICAL MODE OF ACTION OF MYDRIATICS AND MIOTICS—EXPLAINING THEIR EFFECTS IN HYPERTENSION (GLAUCOMA). [1]

By Dr. CARL KOLLER, New York.

WE understand under Mydriatics those chemical agents which widen the pupil, and under Miotics those agents which contract the pupil. If we undertake to explain their mode of action, we have of course to consider the anatomy of the iris, and the forces which normally determine the size of the pupil. This brings us at once face to face with controversies which are ages old, and in spite of an enormous literature have not as yet been fully determined, and which therefore seem to stand where they stood decades ago. This may be seen when consulting the textbooks as to the effects of mydriatics and miotics. In the following I shall limit myself to stating such facts, as are obvious and accessible to the ordinary observer, facts which harmonize well with each other, so that the conclusions drawn appear well founded.

According to most textbooks, mydriatics widen the pupil by paralyzing the sphincter, and stimulating the radiary "dilator." To this stimulating action upon the dilator is ascribed the further increase of a pupil previously widened by paralysis of the oculomotor nerve. The existence of a dilator seemed necessary to account for a number of phenomena, and its reality was assumed, even before the thin layer of radiary fibers on the posterior surface of the iris stroma ("Bruch's membrane") was anatomically found. Correspondingly according to popular teaching the miotics contract the pupil by stimulating the sphincter, and paralyzing the dilator.

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[1] Read before the American Ophthalmological Society at its 57th Annual Meeting, June 14, 1921, Swampscott, Mass.

It is true that for the quick reactions to light and accommodative impulses the sphincter plays the most important parts, but all the facts point to the conclusion, that for the habitual width of the pupil the state of fullness of the iris vessels is the determining factor. For instance everybody has observed that inflammatory congestion of the iris makes the pupil small, that is the vessels are widened and filled; also as is well known narrow pupils are the rule in people whose cerebral arteries are pathologically distended (for instance morphinists). But this aspect of the subject has been overshadowed by the prominence given to the effect of the different agencies upon nerve and muscle tissues.

To help our understanding of these vascular factors which affect the width of the pupil, let us exclude from consideration for the moment all the physiological and pathological factors, and look at phenomena which we know are produced by physical and mechanical forces alone. In death the pupils becomes wide, a fact especially apparent after an animal is bled to death. The blood has left the iris arteries, so that the centripetal push in the vessels is no longer active, and the iris consequently follows the pull of the elastic fibers, which are arranged along the adventitia of the blood vessels.

Further if we take an animal, for instance a white rabbit, previously exsanguinated and inject methylenblue into the aorta under pressure, we will notice, that in the same instant that the ears become blue from the injection fluid, the pupils become as narrow as pinheads. What has taken place is, that the pressure of the injection fluid has filled the iris arteries and erected as it were each sector of the iris, shoving it towards the center. Thus we see that the pupil can be widened by emptying vessels, and narrowed by filling them. This is in perfect accord with the fact that all states of cerebral congestion go with narrow pupils (sleep, morphinism, meningitic coma), whereas all states of cerebral anemia (syncope, epileptic seizure) go with wide pupils.

All the mydriatics known have a constricting effect on the iris vessels, though in a varying degree. In the case of atropine, paralysis of the sphincter is no doubt the predominating factor in widening the pupil, still the constricting action on the vessels is observed every day in its bleaching effect on the eye with "ciliary" or "pericorneal" injection. And it is not the ciliary arteries alone that are subject to this local effect of constriction. The shrunken mucous membrane of the nose, and the blanched pharynx of a person that has received an overdose of atropine by instillation, are proof of this. The flushed face and general hyperæmia of the skin in atropine poisoning (which at the first glance do not seem to fit in with this) are produced by the systemic action of the poison on the central nervous system, whereas the vasoconstriction in question is purely local. Cocaine has to a much higher degree the constricting effect on the iris vessels, and this can be beautifully demonstrated by injecting it subconjunctivally. If this is done at a place not far from the cornea, the iris will in about 5 minutes shrink in that very meridian in which the injection has been made, the pupil becoming excentrically pear-shaped. A parallel to this enlarging effect on the pupil through vasoconstriction in the case of cocaine is seen in the widening of the palpebral fissure. In explanation of this phenomenon a great deal has been said of smooth muscle fibers in the lid (H. Mueller's fibers) and of smooth muscle fibers behind the globe. The obvious fact is that the eyelid shrinks by vasoconstriction. One can observe this equally well on an healthy eye, as on an eye with paralytic ptosis, and on an eye whose upper lid is drooping owing to inflammatory infiltration, as in trachoma.

Further we know one agent, which does not affect the sphincter at all, but widens the pupil, and that by vasoconstriction alone. This is adrenaline. Its effect can not be demonstrated by instilling it, but only by bringing it in direct contact with the iris, or by injecting it subconjunctivally. The same asymmetry of the pupil mentioned in the case of cocaine can be observed when adrenaline (1:10,000) is injected under the conjunctiva. One has to wait for the effect about 15 minutes. After a further lapse of about ½ hour the pupil is less excentric, almost round, but still wide, though it reacts well to light. After another half hour it is of normal width again. This widening of the pupil by adrenaline is a strong proof of the vascular action in dilatation.

In a contrary way miotics, besides stimulating the sphincter, have a dilating effect on the iris vessels; one can directly observe this with a loupe or corneal microscope. Proof of this we have in the action of dionin, which does not affect the sphincter, but contracts the pupil solely by congesting the iris. This miotic effect of dionin is little known, because difficult to observe. One can best demonstrate it on a pupil previously dilated with atropine. It does not last a long time, and one has to watch for it closely.

It is this vasoconstricting effect of the mydriatics and the vasodilating action of the miotics, which accounts for many of the phenomena which we daily observe in our work. It is this vascular effect also, which makes the pupil dilate bow-shaped between adhesions, so it is the vascular action, which makes an iris with a coloboma move up towards the coloboma —no counterforce existing at that place, and exactly the same force, which displaces the pupil of an eye inflamed after combined extraction, upwards or rather pushes it up towards the incision.

The mode of action of mydriatics and miotics in hypertension is of course based upon the physiological effects. But this comes about in a way different from that assumed in the Leber-Knies theory of glaucoma. This theory so long dominant, and according to which the symptoms are still interpreted in the textbooks, says that hypertension is due to retention of liquid in the eye owing to obliteration or clogging of Fontana's space.

If we but look at an eye with a mild attack of acute glaucoma, the state of circulation in that eye is plainly discernible. The pupil is widened and usually irregularly oval; this bespeaks constriction of arteries, more so in some iris sectors than in others. The anterior ciliary veins, which carry blood from the ciliary body, and which leave the eyeball a little back from the corneoscleral junction, are widely distended and engorged, indicating that the intraocular veins, notably those of the ciliary processes, of which they are collaterals, are in the same state of engorgement. This means that the circulation is sluggish. The cornea is œdematous, the anterior chamber is shallow, both lens and iris being pressed forwards on account of the increase of exuded fluid around the vitreous body. Of the presence of this fluid we get incontrovertible proof if we perform a posterior sclerotomy, and note that what escapes first is not vitreous, but a thin liquid, vitreous following after the thin liquid. I believe that Dr. Arnold Knapp first called attention to this fact. Taking all these signs together the obvious interpretation is, that in the acute glaucomatous attack, the arteries of the iris and probably all ciliary arteries are constricted, carrying but little blood, whereas the veins are widened and gorged, which means that the whole circulation is stagnant. This stagnant circulation prevents the disposal of the increased amount of exuded liquid through the ordinary channels. According to the Leber-Knies theory the lymph spaces of the iris angle are the only exit for intraocular fluid. That this is one of the ways is certain, but it is equally certain that it is not the only way. In the healthy eye the anterior surface of the iris, a loose vascular structure, acts like a sponge, taking up the contents of the anterior chamber. That this is so, can be seen after an operation or trauma, when blood in the anterior chamber is found absorbed after a few days, wherever it has been in contact with the iris; but a speck of coagulum left on the anterior lens capsule, removed from contact with the iris, may remain unabsorbed for weeks. It may not be amiss to mention here, that this absorption from the iris surface is hastened by miotics, and delayed by mydriatics, because the rapid circulation acts like a system of drainage ditches, in which the current takes up the moisture of the soil, by side suction due to the flow of the water.

If we keep in mind, that in the acute glaucomatous attack the circulation is slowed up and stagnant, and that mydriatics slow up circulation whereas miotics speed it up, these adverse, respectively favorable effects become intelligible. Their effect is quite in keeping with what we know of the effect of other agencies on the glaucomatous attack. Sleep, administration of morphine, caffeine, hot fomentations, in short all means for increasing the flow of blood to the head, help in relieving glaucomatous hypertension; and it is known to every experienced ophthalmologist that exertion of the accommodation, for instance reading, far from being harmful, exerts a favorable influence.

What in the first instance brings on the sudden prodromal or acute glaucomatous attack, we do not know; in all probability it is a certain toxicity, which in eyes of definite architecture brings on an œdema, comparable to the angioneurotic œdema in other parts of the body.

In chronic ("simple") glaucoma the condition is somewhat different, in that the accumulation of fluid in the eyeball is of purely vascular origin. But with regard to the action of mydriatics and miotics we see the very same effects in all kinds of hypertension, primary and secondary ones, as for instance those caused by swelling of cortex matter after cataract extraction. Mydriatics slow up the circulation by producing anemia through the constriction of small arteries, whereas miotics by dilating the small arteries, speed up circulation, and thus favor the absorption of abnormal quantities of transuded serum.

THE ACTION OF ADRENALIN ON THE GLAUCOMATOUS EYE.[1]

BY DR. ARNOLD KNAPP, NEW YORK.

ON making the usual subconjunctival injection of novocain-adrenalin before operating for glaucoma, dilatation of the pupil was frequently observed. As this dilatation must have been due to adrenalin, it suggested an investigation of the action of adrenalin in primary glaucoma to determine its effect on the pupil and on the intraocular pressure.

Pupil.—In the normal eye the instillation of adrenalin has no effect on the pupil (Elliot, Schultz, Cords, Wessely).

Loewi found that adrenalin dilates the pupil in diabetes, in those suffering from Graves's disease and in pancreatectomized animals; this constitutes the adrenalin pupillary reaction of Loewi and has diagnostic importance to show insufficiency of internal pancreatic secretion and hyperthyreosis.

According to Elliot the irides of various animals do not all react in the same way to adrenalin. In dogs the injection of adrenalin caused a dilatation of the pupil. Wessely obtained a dilatation of the pupil in rabbits after instilling adrenalin in the conjunctiva. In dogs and cats this was never obtained and it was only possible after subconjunctival injection.

Lewandoski found that the intravenous administration of suprarenal extract in a cat caused the same symptoms as an irritation of the cervical sympathetic, namely, mydriasis, retraction of the third eyelid, slight protrusion and slight enlargement of the palpebral fissure. The reaction in rabbits was much less. After section of the sympathetic and extirpation of the superior cervical ganglion, the same symptoms resulted, except that they were more pronounced.

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[1] Read at meeting of American Ophthalmological Society, Swampscott, Mass., June 14, 1921.

Meltzer found that after extirpation of the superior cervical ganglion the pupil reacted more easily to adrenalin than it does in subganglion section of the sympathetic or in a normal animal. The instillation of adrenalin caused a maximal mydriasis, but the extirpation of the ganglion had to be done at least 24 hours before. In some animals after three and one half months the action was still present, but less. Instead of extirpating the ganglion if all communications with the central nervous system are divided, adrenalin action is lost.

Auer says that the sympathetic between the cervical ganglion and the eye must carry two kinds of fibers, those coming from the central nervous system and those originating in the ganglion. This author believes that the post ganglionic fibers carry inhibitory impulses to the pupil, which prevent the pupil from dilating. These are opposite to those conducted by the preganglionic fibers which dilate the pupil by stimulating the dilator muscle. Adrenalin contracts smooth muscle fibers. If it dilates the pupil, the post-ganglionic fibers inhibiting the dilator pupillæ have been eliminated.

Langley drew attention to the similarity of adrenalin action to irritation of the sympathetic. If the pupil dilates to adrenalin it shows increased sensitiveness to sympathetic stimuli or loss of inhibiting influences which come from the superior cervical ganglion or pancreas.

Intraocular Pressure.—In glaucoma adrenalin was used at one time to influence intraocular pressure. Its action was not definitely determined, presumably as the tonometer was then not in general use. Some authors (MacCallan) warned against its use in glaucoma, as it was likely to increase the intraocular pressure.

Spengler believes that adrenalin causes an ischemia of the ciliary vessels, dilatation of the pupils and slight reduction in intraocular pressure.

Rubert found that instillation of adrenalin or subcutaneous injections cause changes in the ocular pressure, at first a reduction, then a rise, and then a secondary reduction. In glaucomatous eyes an occasional increase is not to be denied, so that caution must be exercised.

Shahan and Post, in a study on "Heat in Glaucoma," found that cocain-adrenalin usually causes a drop in tension, followed by a rebound carrying the tension up to or above its previous level, while adrenalin alone causes a rise in tension, cocaine a drop, but when combined a more decided drop in tension resulted, which lasted for about one hour.

According to Leplat, adrenalin given subcutaneously raises the general arterial pressure. As for the eye, hypertonus was never observed, the ocular tension remained constant, and in two there was a reduction.

Observations.—I have examined a series of 65 cases of primary glaucoma, some of which had been operated upon, to observe the action of adrenalin on the pupil and on the intraocular tension. The adrenalin used was Parke-Davis's and it was fresh. After taking the tension with the Schiötz tonometer and measuring the size of the pupil, one drop of adrenalin was instilled every few minutes for five times. After one half hour the measurements of the pupil and of the ocular tension were again taken. Cases with atrophic irides and posterior synechia were necessarily excluded.

I. After adrenalin instillation the *pupil* dilated regularly or excentrically in 60 out of the 65 cases of glaucoma, varying from 1 to 5*mm.* The degree of mydriasis was not so great if pilocarpine had previously been given.

II. In these 65 cases, after adrenalin instillation, the *tension* was unaffected in 40, decreased in 20, increased in 5.

The possibility of dilating the pupil for ophthalmoscopic examination with little prospect of increasing the tension is often of great advantage in glaucomatous eyes. The adrenalin mydriasis can usually be promptly corrected by miotics.

The reduction in tension which occurred in 20 of the 60 cases is particularly interesting.

Wessely believes that adrenalin causes a vaso-constriction which leads to reduced aqueous production and resulting hypotony. My observations lead me to believe that the hypotony results from the relief of mechanical causes and that in some glaucomas there is a retention of aqueous in the posterior chamber and by dilatation of the pupil by adrenalin this stasis is corrected. This was particularly noticeable in the case of S., where the pupils measured Right 3½*mm*, tension

22; Left 3½*mm*, tension 34. The pupillary margin gripped the lens capsule like a crater and the center of the iris was distinctly bulging. After adrenalin the pupils measured 6*mm* each, the tension was reduced to 16 and 22, and the iris contour was perfectly flat. Furthermore, in doing an iridectomy for glaucoma after the corneal incision and the escape of the aqueous with flattening of the anterior chamber, on excising the iris there is often an additional escape of a considerable amount of aqueous which seemed to have been retained in the posterior chamber. This confirms Curran's view advanced in an article, "A New Operation for Glaucoma," that in glaucoma the passage of fluid through the pupil is impeded because the iris hugs the lens over too great a surface and dams back the aqueous. Curran attempts to drain from the posterior chamber into the anterior chamber by a peripheric iridotomy.

III. In 15 of these 65 cases subjected to adrenalin, the glaucoma was only apparent in one eye. The other (normal) eye showed in 12 a dilatation of the pupil after adrenalin, in 3 there was no change, the intraocular pressure was unaffected in 12, in 3 the pressure was reduced. This suggests that a susceptibility to adrenalin may be present long before the usual clinical signs of glaucoma.

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THE CHARACTER OF IRITIS CAUSED BY FOCAL INFECTION.

By WILLIAM L. BENEDICT, M.D., Section on Ophthalmology, Mayo Clinic, Rochester, Minn.

THAT inflammatory lesions of the iris may be produced by the introduction of living bacteria into the blood stream has been demonstrated by several workers. Rosenow,[7] in 1914, injected thirty-five rabbits with strains of organisms from patients suffering from rheumatism, and two of the thirty-five rabbits developed iritis. In 1915, he[8] reported nine cases of iritis or iridocyclitis among forty-eight cases of lesions of the eye produced during the course of a long series of experiments in which animals were "injected intravenously under uniform conditions with streptococci from rheumatism, from appendicitis, from ulcer of the stomach, from cholecystitis, from erythema nodosum, from herpes zoster, from parotitis, from pyorrhea, from tonsils, and from dairy farm products."

Rosenow's[8] experiments demonstrated that iritis occurs in animals as a local bacterial infection following bacteremia artificially produced. The experiments were not intended primarily to produce iritis, but to note what organs are affected when pathogenic bacteria isolated from suppurative foci in human beings are introduced into the blood stream and, further, to test the virulency of various strains of organisms after varying periods of growth on artificial mediums in the laboratory. If the ocular structures are affected by these organisms such affections, Rosenow believes, may be considered an indication of selective affinity for the ocular tissues. Rosenow found that organisms taken from persons suffering from rheumatism more frequently produce ocular lesions than organisms taken from persons suffering from any other disease.

Brown and Irons, in recent experiments, produced iritis in rabbits by intravenous injections of streptococcus, *Bacillus mucosus capsulatis* (Friedländer), *Bacillus pyocyaneus*, and the gonococcus. They concluded that, "bacteria reach the eye by the circulating blood and can be recovered from the eyes of animals in which the iritis has been experimentally produced." In order, however, to produce iritis it was necessary to give large doses of the organism so that a condition of sepsis was created, and then it was produced only occasionally. In 1916, Irons, Brown, and Nadler conducted experiments "with the idea of discovering the changes in the power of an organism (streptococcus), which had already given rise to iridocyclitis in the patient, to produce similar lesions in animals, after varying periods of residence in the original host, of residence in animal tissues, and of growths on culture mediums." These experiments seem to have indicated, "that the invasive power of the organisms for special tissues may change within a short period of time during residences in the original host, during animal passage, and in culture, without pronounced or constant changes in culture characteristics, or any general virulence for animals."

Lewis (1919) produced iritis in a rabbit by injecting into the blood stream a culture of *Streptococcus veridans* grown from a periapical infection in a patient suffering from acute iritis; the same organism was recovered later from a culture of a section of the iris of the rabbit. Lewis writes, "This experiment proves absolutely for the first time, as far as I know, the selective affinity of the organism found in dental root abscesses for the special structure which had been affected in the individual from which the tooth was taken."

Many clinical reports demonstrate the close connection between diseases of the eye and dental infection, tonsillar infection, rheumatism, and other infectious diseases. Since Lang, in 1913, published his opinion on the subject many published case reports have demonstrated the influence of dental sepsis on the eye. Very few of these reports were based on observations further than improvement of the ocular disease following the removal of diseased teeth and freedom from further attacks of iritis. Levy is reported to have said in discussing metastatic iritis, "No one, I believe, among all those investigating these metastatic eye infections, has been able to produce bacteriologic cultures from tissues taken from one of these eyes and only once has anybody ever claimed to have produced an experimental iritis by animal inoculation."

In a series of experiments conducted at the Mayo Clinic fourteen patients with iritis were selected as test cases. The cultures were made and the animals injected by Dr. E. C. Rosenow and by Dr. G. J. Meisser. In order that the patient might definitely be considered a test case it was necessary to eliminate, so far as possible, by the history, the physical examination, and the laboratory tests, other possible causes of iritis, such as syphilis, gonorrhea, and tuberculosis. The method of collecting material from the focus and the cultural methods employed have been described by Rosenow.[9]

The results of these experiments may be summarized briefly as follows[1]:

Of the fourteen patients selected for these tests five had acute (active) iritis in one eye; in nine the iritis was chronic (inactive), or had existed as a low grade uveal inflammation for more than four weeks. Four of the patients were seen during their first attack; ten had been subject to frequent attacks from one year to thirty years previously. Four patients had iritis in only one eye while ten had suffered attacks in both eyes. Iritis was produced in rabbits by cultures made from four of the patients, all of whom were suffering from an acute attack of iritis.

Attempts to produce the disease by injection of cultures made from foci found in patients having acute iritis were successful in all but one instance. Iritis was not produced in a single instance by injection of cultures made from the foci of patients who had chronic, but inactive, iritis at the time the culture was made.

Four of the patients gave a voluntary history of "rheumatism," and one of gonorrhea twenty-eight years before his first attack of iritis.

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[1] A detailed report of these experiments with case histories and photomicrographs may be found in the *Transactions* of the American Ophthalmological Society for 1921.

DISCUSSION.

Until Lewis, in 1919, published his report demonstrating the selective affinity for the iris of *Streptococcus viridans* from a focus of infection of a person suffering from iritis, there was little direct evidence to prove that organisms may assume an affinity for the iris without being sensitized by passage through eyes. Irons, Brown, and Nadler injected dead organisms into the anterior chamber of the eye of a rabbit and later injected living organisms into the blood stream of the rabbit. Iritis developed in the previously injected eye and they concluded that the injection of the killed organism tended to lower the resistance of the eye, making it more susceptible to attack by this particular strain of bacteria. Thus the iritis simulated recurrent iritis in man. The organism used was obtained from a person who had purulent dacryocystitis. It had not produced lesions in the iris of the patient. It is hardly plausible that its development in the lacrimal sac would raise its affinity for the uveal tissue of the eye because of its juxtaposition, or because of the function of the lacrimal apparatus.

Levy, Steinbugle, and Pease attempted to produce iritis in rabbits by injecting bacteria into the lymph channels, but all their animals died without showing eye lesions, so they decided they would have to use some other animal. In their experiments injection of strains of organisms taken from foci of infection of persons suffering from acute or chronic iritis produced other lesions in the animal, but, although large doses were given, the rabbit did not develop iritis.

During several years of animal experimentation, Rosenow collected and published notes on forty-eight cases of ocular lesions produced in rabbits by inoculation, but of these only nine had iritis. The sources of the bacteria used in his experiments were varied, but none, so far as we know, were taken from persons who were subject to attacks of iritis. There were no opportunities for the organism used to be sensitized by passing through a host having eye disease, so we may believe that organisms (streptococci) may develop an affinity for the iris without having lived in a host having lesions of the iris.

The frequency with which bacteria from persons having rheumatism attacked the eye led Rosenow to believe that there is a closer connection between iritis and rheumatism than between iritis and other bacterial diseases. This relationship, however, holds more for cases of infectious arthritis and localized muscular rheumatism than for acute rheumatic fever. In man the attacks of iritis produced by focal infection may be of any degree of severity. Mild attacks of iritis may occur, "which amount to no more than a transient hyperæmia of the conjunctiva or a slightly troublesome photophobia. A rapid succession of mild attacks extending over a period of several years has been demonstrated to be due to periapical infection."

One of our experiments seemed to show that similar attacks of iritis may occur in the animal, and that the organisms isolated from a focus of infection during an acute attack, or an exacerbation of chronic iritis, are more prone to localize in the iris and produce inflammation than those taken from persons who have not suffered from acute attacks of iritis for a number of years. Some of the patients, in these experiments, had had low grade uveitis with punctate keratitis and posterior synechia for years; they had numbers of infected teeth from which streptococci were isolated and cultured, and injected into rabbits without noticeable symptoms in the rabbit. It is possible that the iritis of these patients was not due to focal infection around the teeth, even when the organisms usually found to produce iritis were present, or that the organisms were obtained after they had lost their virulence, or that too small doses were given to the rabbits. In some of the animals, the muscle and periosteal lesions indicated a virulency of the organisms injected, but the fact that iritis did not develop could not be interpreted as meaning that the iritis in the patient was not caused by this particular strain of bacteria. It was impossible to secure the results desired except by inoculating with fresh cultures (twenty-four hours or less). Again, other organisms were so attenuated that massive doses failed to produce symptoms in the inoculated animal, even though primary cultures were used. Iritis was produced in the rabbits whenever injected with a culture taken from a person having an acute iritis, but was in no instance produced when inoculated with organisms taken from persons whose eyes were not acutely inflamed.

The symptoms and course of the iritis in the rabbits ran about the same as in the patients. The first sign is hyperæmia of the conjunctiva and sclera about the limbus. This is followed by injection of the vessels on the iris, swelling of the iris tissue, discoloration of the iris due to congestion, a slight contraction of the pupil, and turbidity of the fluid of the anterior chamber. The pupil did not contract to less than half its diameter in any case.

That the iritis was produced in the animals by bacteria carried to the eye by the blood stream was amply demonstrated in these experiments. In one case the culture made from the iris of a rabbit was injected directly into the anterior chamber of the right eye of another rabbit. The following day the same organisms, green-producing streptococci, were recovered from the uninoculated left eye. Fluid from the anterior chamber of this eye was then injected into the anterior chamber of the left eye of another rabbit. After ten days the rabbit was necropsied, and the organism was recovered from the iris of the uninjected right eye. The same organism was also recovered in cultures of the blood of the heart, thus showing that the organisms gained access to the blood stream of the injected eye and collected in the other eye. There were hemorrhagic lesions in other parts of the body which also yielded pure cultures of green-producing streptococci.

The organisms most frequently obtained in the cultures from dental abscesses and granulomas were green-producing streptococci (in short chains) and as diplococci (*Streptococcus viridans*), and staphylococci. In watching these experiments we were convinced that the *Streptococcus viridans* was the organism that produced the lesions in rabbits and that the staphylococcus was a harmless organism. The best proof of this assumption came from the culture made of the lesions produced in the animals by the inoculation of the mixed primary culture. In all instances the cultures made of hemorrhagic lesions around the muscles, the periosteum, the jaws, from the anterior chambers of the eyes, and of bits of infected iris tissue produced only *Streptococcus viridans*. Staphylococci were not present.

Plate cultures of the organisms were made at the time the cultures were made in long tubes of liquid medium. On the plates large numbers of colonies of streptococci and a few colonies of staphylococci appeared. Attempts to produce iritis in rabbits with organisms grown on the plates were never successful, since the bacteria grown in this matter soon lose their peculiar infecting power for certain tissues; they retain it, however, when grown in tall tubes of medium. Our experiments sustain Rosenow's contention that in order to retain a specific affinity the organisms must be grown under conditions of oxygen tension similar to those to which they are accustomed. In the tall tube the organisms usually develop near the bottom and gradually come to the top as they acquire the ability to grow in the presence of more oxygen. One reason why other experimenters have failed to produce the organisms with selective affinity probably is the fact that the organism responsible for the specific lesion succumbed to the air during the growth of the culture, or lost its affinity through acquiring ability to live under changed environment.

The largest hemorrhages in the iris of the rabbits in which iritis was produced occurred at the juncture of the iris and the ciliary body, where there is a change from highly vascularized tissue to relatively poorly vascularized tissue, with resulting diminution of available oxygen, and in consequence diminished resistance to invading organisms. Similar lesions were found in muscles of the legs, near the tendons, in the periosteum, and around the roots of the teeth. Whether oxygen tension is the chief factor in the selection of the tissue affected cannot be determined from these experiments, but they sustain the conclusion suggested in Rosenow's experiments with streptococci of muscular rheumatism and arthritis.

We may, therefore, conclude that iritis is produced by bacteria arising from foci of infection around the roots of teeth and in the tonsils, that it is an inflammatory reaction brought about by the presence of bacteria in the tissue of the iris carried to the iris by the blood stream from the foci of infection, and that such bacteria have the ability to grow and do grow in such environments. Iritis caused by bacterial infection seems to be an inflammation of muscle tissue at the place corresponding to the parts of muscles affected in rheumatic affections of the limbs and trunk. Organisms have repeatedly been recovered from muscular lesions of the legs and trunk, and when injected into animals produced similar lesions. In numerous instances the muscles and parts of muscles affected in the animal correspond to the muscles and parts of muscles affected in the host from which the organisms were obtained. That there is a close similarity between the lesions of the leg and the trunk muscles in rheumatism, and the lesion of the iris in iritis, has been demonstrated time and again in the cases here reported. That they may have a common source is suggested by the fact that they can be produced in the rabbit by the same culture at the same time, almost to the total exclusion of other types of lesions or similar types of lesions in other than muscle tissue.

Therefore, we may conclude that iritis of focal infection origin is a myositis caused by an organism that at some period of its growth may cause iritis, and at other periods inflammation of some other muscle. We may further conclude that this affinity for iris tissue becomes a function of the organism spontaneously, or may be acquired by growing on iris tissue, that the affinity for the iris is easily lost by the organism when grown in different environments, and that it will change its affinity for special structural tissue or even lose its virulency to a marked extent.

As the bacteria around the teeth and tonsils are constantly undergoing changes of environment, they suffer a change of function and a change of virulency. There is also a change in the resistance of the body to bacterial invasion, so that in the human body a constant warfare is going on between bacteria and the body tissues and fluids. Iritis occurs as a localized seat of this warfare within the eye and is in all possible respects similar to reactions brought about in other parts of the body by the presence of the same bacteria at different times of the life cycle of the organism.

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A CASE OF INTERMITTENT EXOPHTHALMOS.[1]

By Dr. W. GORDON M. BYERS, Montreal, Canada.

(*With one illustration on Text-Plate XXVI.*)

APART from the rarity of the condition, the following case of intermittent exophthalmos seems worthy of recording, because of certain apparently novel clinical findings, and because of the additional light that these findings may throw upon the nature of the disorder.

Mrs. M., age 21 years, consulted me on March 22, 1921, complaining of a sunken condition of the right eye, which bulged on stooping, and of a feeling that the eye would become "dislocated." Her dread of the globe falling out was carried on into the night; for the proptosis also followed lying on the right side, with pain, and the patient was frequently awakened to find the eye protruding, as the result of having got into that position. A great deal of sleep had been lost in this way; and, to ensure rest, she had tried various expedients with indifferent success,—bandaging the eye; starting the night on the right side, and turning to the left just before passing into slumber; bolstering herself up with pillows in different positions, etc.

The patient complained deeply also of pain in the right temple, aching in character, "as if an abscess were present deep in behind the eye," and extending "like an earache" to the right ear, where it was felt sometimes to the inside of, at others to the outside of, the tragus; of pain over the whole top of the head, making her feel she would like to lift off the calvarium, and causing her often to unloosen her hair "which she felt a burden"; of the right eye "feeling hot," "as if it were reflecting heat on to the face"; and of stiffness and tenderness on the right side of the face, in addition to the pain already described. Associated with all this discomfort was an almost constant headache. This was generally frontal in situation, but it often extended to the whole head. It seemed to come from the eye, and made the patient feel "utterly weary."

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[1] Read at the meeting of the American Ophthalmological Society, June 14, 1921.

The changes in the right eye were first observed in 1915; and since that time the variations have gradually become more noticeable. The patient's father has thought that the eye looked different from birth, and one can fancy that the globe appears slightly sunken in a photograph taken at the age of eight; but the evidence is not convincing. In any case there was no consultation with an oculist until 1915. No definite connection with trauma could be established.

In the family history the only thing of interest is that the father has a congenital, raised nævus about the size of a large pea, just below the exit of the supra-orbital nerve on the left side.

The patient is a healthy looking woman, 5 feet 7 inches in height, and 155 pounds in weight. The right side of the face is slightly, but definitely, smaller than the left; but apart from this the general examination is entirely negative. There are no venous enlargements of any sort in any part of the body, in any position, and there is no orbital bruit.

The right eye (in the upright position) is sunken, showing 15*mm* with Hertel's exophthalmometer, as compared with 22*mm* for the left side; it lies somewhat loose in its socket; and the palpebral space is slightly wider than on the left side (22*mm* for the right eye, as compared with 20*mm* for the left eye). The fold of the upper lid is retracted.

Following stooping; pressure on the internal jugular; turning the head to the left; or to the right; on throwing the head well back; and on holding the breath after forced expiration, the right eye bulges in the way we have come to regard as characteristic of intermittent exophthalmos. The degree of proptosis varies with the degree of pressure exerted on the jugular, and with the different positions in the order given. Without pushing the effort to the limit, for safety's sake, an exophthalmos of 25*mm* can easily be produced by pressure on the internal jugular,—a range for the globe of 10*mm*

The direction of the bulging and the rapidity with which it occurs are nicely shown by the Maddox rod test: at rest, there is a left hyperphoria of 1° and an exophoria of 1°. Following pressure on the jugular, the right eye (as shown by the line of light) immediately begins to deviate upwards and to the right, there being a change, with full proptosis, to 2° of right hyperphoria, and 2°–3° of exophoria.

There is no limitation in the movements of the globe, and no diplopia in any part of the field (with colored glass and candle) either while the eye is at rest or during proptosis.

Returning to the routine examination of the globe, one notes an entire absence of congestion; the pupils are regular, active, and equal, and the media clear. Ophthalmosopically, with entirely normal conditions on the left side, one sees the following changes on the right (see drawing). The fundus as a whole looks ruddier than normal,—is, indeed, markedly congested. This applies especially to the disk, over and around which is a strikingly large number of venules and arterioles. The papilla shows a deep physiologic excavation, and a broad band of pigmentation about its upper half. The arrangement of the larger vessels is highly irregular. A number of arteries and veins emerge from the periphery of the disk in the manner of cilio-retinal vessels; and very generally the vessels bifurcate over the surface of the disk, instead of at the usual distance. Both veins and arteries, but especially the former, are fuller (larger) than normal; and the early ramifications give one the impression of a marked multiplication. There is, however, an actual increase in the number of vessels, in addition to the vascularization about the disk already mentioned. One has certainly an extra macular vein and artery of small size, and an extra medianal vein and artery of large size. A slight, but quite definite, œdema of the circumpapillary nerve fibers is discernible; as well as distention of the veins (but no pulsation) following pressure on the internal jugular.

The fields of vision are full, and central vision as follows: O.D. with +2.25 sph. = $\frac{6}{5}$; O.S. with +2.00 sph. = $\frac{6}{5}$. No increase in the hypermetropia during proptosis can be made out.

Tension: O.S., 11*mm* Hg, O.D., 8*mm* Hg. The intraocular pressure of the right eye rises 3 to 4*mm* Hg following pressure on the jugular with proptosis.

REMARKS.

The purpose of this paper is met by the statement that the following factors are now generally held to unite in producing the clinical picture described in this report, and rather inadequately covered by the term intermittent exophthalmos:

1. A varicose condition of the orbital veins of, supposedly, congenital origin.

2. Pressure on the internal jugular by the surrounding parts, altered in their relationships by changes in the position of the body.

3. Inadequate collateral drainage, both forward and backward, in the event of blockage of the internal jugular.

The swollen and multiplied vessels in the right fundus of my case imply a similar condition of the extraocular vessels, *i.e.*, a retro-ocular varix; and the irregular distribution of the vessels certainly bespeaks a congenital origin. It is conceivable that the arterial overgrowth might be secondary to heightened venous pressure following blockage; but this hypothesis is ruled out by the low tension readings in this case, taken while the proptosis was at its height.

In casting about for a cause of jugular constriction, it occurred to me that a cervical rib, if present, might act in this way; and X-ray photographs show, in fact, that a supernumerary rib is present on the side affected, and that it moves to a certain extent in association with rotation of the head. Dr. Cheney's notes are as follows:—

"Plates were taken of the neck directly antero-posteriorly, one with the head looking directly forward, and one with the head looking sharply to the right. From the seventh cervical vertebræ the transverse processes are seen to extend slightly farther than normal. On the right there is a cervical rib, a little more than 1¾ inches in length, tapering away from its vertebral attachment to a sharp point, which seems to rest upon the upper part of the first rib. When the head is turned toward the right side, the space between this rib and the first dorsal changes its shape and size, showing that with the movement of the head this cervical rib moves."

The rib in this instance is not complete; but it is sufficiently large to account for a certain narrowing of the ring through which the vessels of the neck must pass, as well as for the heightening of the pressure upon the vessels which follows the positions that have been described. There is the possibility also that one may have here a strand of connective tissue passing from the tip of the rib to, or toward, the sternum. Cases of this nature have been described; but of course the band would not show on the plate. The chances of constriction, however, under these circumstances would be greatly enhanced; and this would apply still more to those cases in which the rib forms a complete osseous ring.

It is obvious that a supernumerary rib could not be regarded as the sole cause of intermittent exophthalmos; for cervical ribs are of not infrequent occurrence, and no connection has heretofore been established between the two conditions. Moreover, one can tie off both jugular veins without producing proptosis. There must, therefore, be additional factors at work; but if one grant the presence in these patients of an inadequate collateral drainage for the internal jugular, one has in the concomitant occurrence of this condition and of a supernumerary rib a probable cause for the present case, and by inference for a certain percentage of the cases of this type. It is not necessary in these circumstances to assume a congenital weakness of the veins; for venous dilatation would gradually take place as the result of pressure. On the other hand, an unusual arrangement of the vessels, such as one has in the present case, would act as a rare factor in favoring the development of an orbital varix.

The treatment of intermittent exophthalmos is in process of development. Tarsorrhaphy, as recommended by Hippel (1), is merely palliative; and removal of the enlarged veins, as successfully reported by Löwenstein (2), might be followed by such disastrous consequences as to make one loath to carry out the procedure. The question of operation in this case is still under consideration.

In connection with this case it is of interest to note that since undergoing an operation for a tubal pregnancy about a month after the foregoing report was written, the patient has been almost entirely free from the generalized headaches of which she complained; and that the proptosis, though still annoying, is not so easily produced, or so pronounced as previously. We have here another instance of the influence of the pregnant state upon the vascular system as a whole.

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REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by DRS. A. N. ALLING, New Haven; M. J. SCHOENBERG, New York; T. H. BUTLER, London; P. G. DOYNE, London; and K. WESSELY (*Archiv für Augenheilkunde*), Würzburg.

Edited by MATTHIAS LANCKTON FOSTER, M.D., F.A.C.S.,
New Rochelle, N. Y.

I.—THE EYE AND GENERAL DISEASES AND POISONS.

1. CORDS. **Eye symptoms in epidemic encephalitis.** *Klin. Monatsbl. f. Augenheilkunde*, 1920, p. 849.

2. ENGELKING. **Eye changes observed in familial polycythæmia.** *Ibid.*, 1920, p. 645.

3. GRAHE. **Studies of the hearing and equilibrium apparatus in lethargic encephalitis.** *Münch. med. Wochenschr.*, 1920, p. 629.

4. JUNIUS. **Rare rheumatoid affection with simultaneous disease of the eye.** *Deutsche med. Wochenschrift*, 1920, p. 647.

5. MARBURG. **Optic neuritis and multiple sclerosis.** *Klin. Monatsbl. f. Augenheilkunde*, 1920, p. 558.

6. MEESMANN. **Pigmentation of the limbus corneæ in Addison's disease.** *Deutsche med. Wochenschr.*, 1920, p. 644.

7. MORITZ. **Epidemic encephalitis.** *Münch. med. Wochenschr.*, 1920, p. 712.

8. SPEIDEL. **Late results of encephalitis after grippe.** *Ibid.*, p. 630.

9. STIEFLER. **Lethargic encephalitis.** *Wiener klin. Wochenschrift*, 1920, No. 14.

10. STRÜMPELL. **Epidemic encephalitis.** *Deutsche med. Wochenschrift*, 1920, p. 705.

11. TRIEBENSTEIN. **Aleukæmic eye changes.** *Klin. Monatsbl. f. Augenheilk.*, 1920, p. 825.

12. WILMER, W. H. **Effects of carbon monoxide upon the eye.** *American Journal of Ophthalmology*, February, 1921.

TRIEBENSTEIN'S (11, **Aleukæmic eye changes**) case at first appeared to be one of a tumor pressing the right eyeball downward and inward; later exophthalmos, opacities in the lens and vitreous, increase of tension, and excavation developed.

The iris was discolored and hyperæmic. Examination of the enucleated eye showed that the entire globe was surrounded by the tumor mass, which was composed of lymphocytes. The cellular infiltration extended toward the orbit partly through displacement of the fibers of the orbital tissue, but mainly about the vessels. In the eye itself the iris and particularly the choroid, was infiltrated, with the exception of the layer of capillary vessels of the latter. The vitreous lamella, the pigment layer, and the retina showed no essential change. The optic disk was enlarged, its sheath much infiltrated. The blood picture showed a normal proportion between the red and white cells, so the disease was pseudoleucæmia. The adventitia of the vessels appeared to be the starting point of the neoplasm.

ENGELKING (2, **Eye changes observed in familial polycythæmia**) observed an entire family with this disease, which was clearly differentiated from morbus cœruleus and from secondary polyglobulia. A dark venous discoloration of the conjunctiva corresponded to the cyanosis present elsewhere. The retinal vessels, which were about normal in caliber and course, were very dark, especially the veins. The papilla was ruby red, the color of the fundus somewhat of a bluish red. No signs of inflammation or engorgement were found in either the optic nerve or the retina. No tortuosities, dilatations, or varicosities, which have been held by former writers to be pathognomonic, were observed.

MEESMANN (6, **Pigmentation of the limbus corneæ in Addison's disease**) reports a case of Addison's disease in which the discoloration of the conjunctiva at the limbus formed a ring 3*mm* broad with the slit lamp the radiating lymphatics at the limbus could be seen to be dilated and their walls filled with pigment, and newly formed lymphatics extending to the inner margin of the pigmentation. The pigment was thought to have originated probably from the epithelial cells. The new formation of lymphatics was looked upon as a reparatory process.

JUNIUS (4, **Rare rheumatoid affection with simultaneous disease of the eye**) directs attention to a symptom complex characterized by a rapidly advancing stiffening of the joints and of the vertebral column and a chronic iridocyclitis. In one case there was a nodular iritis of tuberculous nature, but otherwise there were no signs of tuberculosis. (So far as can be judged from the German abstract of this paper, no search was made for a focus of infection which might have accounted for all of the symptoms.—Ed.)

MARBURG (5, **Optic neuritis and multiple sclerosis**) finds histologically a destruction of the medullary sheaths, while the axis cylinders may continue to exist. The foci may occur in very different places, as on the papilla giving rise to choked disk, or the vessels may be only slightly involved and the atrophy have a rapid onset. The frequency of retrobulbar neuritis in multiple sclerosis is uncertain. The affection of the optic nerve in this disease is characterized by the transient nature of its symptoms; it tends to recurrences, but seldom to serious permanent changes; although the temporal paleness of the nerve head may remain, the scotoma often disappears completely.

As epidemic encephalitis began to appear during an epidemic of grippe, the two forms of disease were at first confused, the more so as grippe can occasion a certain form of encephalitis. As lethargy is not common to all cases, STRÜMPELL (10, **Epidemic encephalitis**) prefers the name epidemic encephalitis. While the initial symptoms of the disease are manifold and usually not very characteristic, such cerebral symptoms as restlessness, confusion, pareses of the ocular muscles, nystagmus, and faulty pupillary reactions appear within two or three days. The development of other symptoms allows various forms to be differentiated. The anatomical basis for the symptoms appear to be changes in the region of the corpora quadrigemina, in the region of the nuclei of the eye muscles, and in the lenticular nucleus, but the immediate cause of the disturbances is to be sought less in the anatomical than in the toxic injury of the nervous tissues.

MORITZ (7, **Epidemic encephalitis**) ascribes especial diagnostic value to the ocular disturbances, diplopia, ptosis, pupillary changes or nystagmus, alone or combined, particularly when associated with somnolence. Somnolence is not always present, though often. He thinks the seat of the disease is in the region of the corpora quadrigemina, the pons and the medulla oblongata. Microscopically he has found perivascular cellular infiltrates, proliferations of the glia, and foci of neuronophagia.

Among 25 cases STIEFLER (9, **Lethargic encephalitis**) found the choreic form the most common motor symptoms of irritation, usually associated with pareses of the ocular muscles, pupillary disturbances, and pareses of the bulbar nerves.

SPEIDEL (8, **Late results of encephalitis after grippe**) had the opportunity to examine a number of patients who had suffered from encephalitis. In general they felt well, but yet traces of the disease remained so that there was only one who could be said to have fully recovered. There was facial paresis in two cases, associated in one with a partial paresis of the oculomotorius, monolateral reflex immobility of the pupil in one, while in others paræsthesias, muscular twitchings, persistent lethargy, listlessness, and general rigidity of the body were observed.

CORDS (1, **Eye symptoms in epidemic encephalitis**) reports his observations in twenty cases of epidemic encephalitis. The most prominent eye symptoms were ptosis, paresis of the associated functions, and nystagmus. He thinks that a vertical nystagmus appearing as the pareses of the vertically acting muscles pass off indicates a weakness of the center for elevation and depression of the eye.

GRAHE (3, **Studies of the hearing and equilibrium apparatus in lethargic encephalitis**) says that subjective disturbances of hearing are scarcely noticed, and objectively very little abnormal can be detected. In the vestibule and in the cochlea alternating increased and decreased excitability without any regularity was detected. The disturbances seem to be due to transient central changes.

WILMER (12, **Effects of carbon monoxide upon the eye**) draws attention to the danger from this gas in modern life. It is produced wherever combustion of carbon-containing material occurs, for instance, in the production of water gas, in the exhaust of the automobile and from burning coal. The more common symptoms are headache, vertigo, tinnitus aurium, blurred vision, absence of tendon and pupillary reflexes, nausea, palpitation, hallucinations of sight and hearing. The poison seems to act by combining with the hemoglobin of the blood and reducing its oxygen-carrying power.

He relates, at length, the experiences of a family, which moved into an old house and immediately began to fail in health being affected with hallucinations.

The cause was found to be gas poisoning due to a defective furnace flue. Four years later WILMER examined one of the children who seems to have been the only member of the family to have been permanently injured by the experience. He found no evidence of eye trouble except a contraction of the visual field and an enlargement of the blind spot, which he attributes to the effects of the gas. Another case of atrophy of the optic nerve and contraction of the field he believes was caused by inhalations of gas from a gasolene torch which the patient has been using and which had made him ill.

ALLING.

II.—OCULAR DISEASES, REMEDIES, AND INSTRUMENTS.

13. ATKINSON, F. L. **Snow blindness.** *Royal Society of Medicine.*

14. DE SCHWEINITZ, G. E. (1) **Epibulbar carcinoma nine years after removal of a papilloma of the corneoscleral margin.** (2) **Small spindle-celled hemangioma of the eyelid of a child aged five months: Excision followed by radium treatment.** (3) **Pathological histology of a concussioned eye following gunshot wound of the orbit.** *American Journal of Ophthalmology*, February, 1921.

15. ELSCHNIG. **Bacterioscopic prophylaxis of postoperative infection of the globe.** *Zeitschr. f. Augenheilk. Festschr. f. Kuhnt*, p. 309.

16. GRUTER. **Optochin and the eye, with special reference to ulcus serpens.** *Zentralbl f. d. g. Ophthalm.*, iii, No. 3.

17. WOLFFLIN. **Protective shell for the eye against X-rays.** *Schweiz. med. Wochenschr.*, l., No. 10.

ELSCHNIG (15, **Bacterioscopic prophylaxis of postoperative infection of the globe**) places some drops of sterile bouillon in the lower fornix, transfers them with a sterile glass pipette to tubes of serum bouillon, and incubates them for from 24 to 48 hours. Out of 1500 patients with cataract thus investigated, he found 694 sterile. Streptococci or pneumococci were found in 20% of the cases, staphylococci in 29%, diplobacilli in only 12 cases. Preliminary treatment was instituted whenever the findings were positive, hydrarg. oxycyanat. 1:500, washing the everted lids and hourly instillations. When streptococci were present, instillations of optochin every half hour and washing out the lacrimal canal once a day with ¼% optochin. A few days later a reëxamination, which must be made at least five hours after the last treatment, will show that the infection usually has passed away, that the most obstinate microorganisms are the small forms of staphylococci, and that in almost 5% positive results can be obtained a few days after the first negative, which may be due in part to a faulty carrying out of the first examination, and in part to an intermediate reinfection. Among the operative infections he found 8 of streptococci, leading in five to removal of the eye, in three to occlusion of the pupil, and 29 of staphylococci, of which nine eyes were lost; a total of 2.46% infections and 1.73% of complete or almost complete loss of the eye. The great importance ascribed to the staphylococci is striking.

WOLFFLIN (17, **Protective shell for the eye against X-rays**) describes a prothesis of lead glass which is placed over the cocainized eye like an artificial eye, and can protect either the entire eyeball, or only the pupillary region, from injury by the X-rays.

DE SCHWEINITZ (14, (1) **Epibulbar carcinoma nine years after removal of a papilloma of the corneoscleral margin: (2) Small spindle-celled hemangiosarcoma of the eyelid of a child aged five months, excision followed by radium treatment: (3) Pathological histology of a concussioned eye following gunshot wound of the orbit**) relates the following cases: (1) A mass arising from the sclerocorneal junction which protruded through the lids was removed with the eyeball and an exenteration of the orbit done. A papilloma of the same region, following an injury, had been excised nine years before. The interior of the eye was not invaded. (2) Practically the entire lower lid was involved by an oblong tumor of bluish color, slightly lobulated with the skin freely movable over it. The mass was excised and the wound closed except for an opening to allow the insertion of a radium tube.

About 80 cases of sarcoma of the lid are on record but this is among the youngest. (3) Case of wound of the orbit by a bullet which passed through without doing injury to the globe or optic nerve. There was exophthalmos and hemorrhages in the fundus but not free blood in the virtreous. The eye was very painful and was enucleated. The retina was found detached on one side and everywhere the seat of hemorrhages. The optic nerve was degenerating and filled with leucocytes.

ALLING.

GRUTER (16, **Optochin and the eye**) comes to the following conclusions: Optochin is a specific against pneumococci. The streptococcus viridans is also affected by the action of optochin, but is much more resistant. The specific action of optochin can be demonstrated both in animal experiments and in bactericidal test tube experiments. This action is influenced considerably by temperature and by the duration of the experiment. Addition of serum causes a precipitation of albumin in the test tube, and a moderate inhibition of the bactericidal power of optochin. Fresh pneumococci from ulcers or the conjunctiva are a hundred times more resistant to optochin than laboratory stocks, but the natural resistance of these fresh stocks of pneumococci varies notably. The bactericide action of optochin is not demonstrably influenced by a high virulence of the pneumococci. Solutions of optochin retain their strength not longer than fourteen days at most, so it is necessary to always use a fresh solution. The combination of optochin hydrochlorate and atropine sulphate must be avoided, as it results in the precipitation of the insoluble optochin sulphate. Solutions of one per cent are inefficient in the treatment of ulcus serpens, or to sterilize the conjunctiva. For ulcers with deep infiltration it is recommended that a pledget wet with 5% optochin be applied for five minutes and repeated every day. The use of stronger solutions induced excoriations of the cornea and conjunctiva. Optochin should never be injected between the lamellae or into the anterior chamber. By instilling a 1 to 2 per cent solution of optochin once or twice a day for at least two days, the conjunctival sac may be rendered free from pneumococci. In the treatment of catarrh of the lacrimal sac optochin has only a transient effect. The success of the treatment of ulcus serpens depends upon the situation of the foci of pneumococci; if they are superficial the result is good, but the effect becomes less marked as the infiltration is deeper and more extensive. Prolonged use of optochin may give rise to trouble, such as the excitation of an iritis with danger of a secondary glaucoma induced by circular synechia. Faulty regeneration of epithelium, which may lead to reinfection, has been observed after repeated use of optochin. An essential shortening of the length of treatment through the use of optochin has not been determined. The partial failure of optochin does not depend on an induced resistance of the pneumococci in the ulcer to optochin, but on the faulty ability of the drug to penetrate deeply, which in turn is occasioned by the precipitation of albumin. Optochin is no better than other known remedies for the treatment of ulcers with deep infiltration.

SURGEON-COMMANDER ATKINSON (13, **Snow blindness. Its causes, effects, changes, prevention and treatment**) was a member of the 1911–1913 Antarctic expedition and later in 1919 was serving on the northern Russian front. He therefore has had unique opportunities for examining this condition and can speak with authority.

He first contrasts this condition of snow blindness with eclipse blindness and the conditions produced in workers who are engaged in welding operations with high power electricity.

Of the two latter conditions in one, eclipse blindness, there is prolonged exposure to intense light, which results in an immediate positive central scotoma with loss of color perception. This state of affairs may remain permanently and later some pigmentation may be observed at the fovea, which suggests that some coagulation of tissue elements has occurred due in all probability to the heating effect of the red rays.

In the other condition, electric ophthalmia, which is produced by the momentary exposure to an intense light, there is a latent period of a few hours and then an acutely irritative condition of the cornea and conjunctiva arises. Recovery is usually complete. Atkinson points out that both these effects are only produced in the unprotected or insufficiently protected eye.

There are two distinct types of snow blindness.

1. Due to exposure to excessively strong illumination. This occurs when the sun is at its maximum altitude. The reflection and refraction of light from and through the surface of the ice-crystals causes an intense illumination, the ice-crystals having a special capacity for the violet and ultra-violet rays. The actinometer time in these conditions approached the lowest actinometer time records taken in California. Exposure of the unprotected eye on such a day for fifteen minutes was sufficient to produce this type of snow

blindness. Symptoms consisted in corneal and conjunctival irritation very similar to those of electric blindness, and in addition there was some hyperæmia of the retina and blurring of color vision. Under treatment the condition usually lasted forty-eight hours and recovery was complete.

2. The second type of the disease occurred on dull overcast days when the air was full of falling ice-crystals. Under such conditions the important factor is the lack of contrast in the field of vision. The falling ice-crystals cause so great a diffusion of light that it is often impossible to recognise objects at close range. The symptoms in this type are those of muscular strain due to the tiring of the ocular muscles from lack of sufficient fixation stimulus, there being so little contrast in the visual field.

A diplopia, lasting several days, is produced and in addition there is some degree of corneal and conjunctival irritation, but to a much slighter extent than in the first type.

Atkinson states that efficient protection was only given by red or amber tinted glasses. He believes that it is the violet rays which produce the condition particularly as they are intensified by the reflection and refraction from the surfaces of the ice-crystals and their number is increased by an increase in the altitude of the sun.

Red or amber tinted glasses also will give the most efficient contrast on the dull days and so help the second form of this condition.

P. G. Doyne.

III.—ANATOMY, BACTERIOLOGY, PATHOLOGY, MALFORMATIONS.

18. Friede. **A case of congenital scleral cyst with choked disk.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., p. 783.

19. Gifford, S. R. **Trichomycetes in ophthalmology.** *American Journal of Ophthalmology*, January, 1921.

20. Kraupa. **Crescentic absence of the scleral band as a deviation from the usual condition of the corneoscleral margin.** *Klin. Monatsbl. f. Augenheilkunde*, lxiv., p. 698.

21. Kubik. **Anatomy of the angle of the anterior chamber.** *Ophthalm. Gesellschaft, Heidelberg*, August 5–7.

22. Lenz. **The corpora quadrigemina in malformations of the eye.** *Ibid.*

23. Rados. **Local eosinophilia.** *Ibid.*

24. SANTOS-FERNANDEZ, J. **The measurements of the nasal canal according to the race.** *American Journal of Ophthalmology*, January, 1921.

25. VON DER HEYDT, R. **Microscopy of the living eye with the slit lamp of Gullstrand.** *Ibid*, March, 1921.

26. WOLFRUM. **The regeneration of simple and perforating defects of the cornea.** *Pathol. Gesellsch. Heidelberg*, August 5–7.

RADOS (23, **Local eosinophilia**) claims that the difference between the eosinophilia of acute and of chronic inflammation is quantitative and not qualitative. In acute inflammation eosinophile cells are sparsely present, to become abundant only in the end stage of the acute and in the chronic. He has found a local eosinophilia in six cases, including some in which there was no perforating wound, such as glaucoma, a necrotic melanosarcoma of the choroid, and a lime burn of the conjunctiva and cornea. The others were cases of fresh wounds, except one nine days old produced by a splinter of copper. Tissue eosinophilia and blood eosinophilia do not always go hand in hand, for in spite of large accumulations of eosinophile cells in the tissues, they are often wanting in the vessels. The eosinophile cells are often mononuclear, and in many cases these alone are present. These facts, the absence of eosinophile cells within the vessels in tissue eosinophilia and the presence of the mononuclear forms, would seem to indicate the origin of the cells in the tissues and their migration into the blood vessels.

WOLFRUM'S (26, **Regeneration of simple and perforating defects of the cornea**) experiments on guinea pigs go to show that, whether the wound is perforating or not, the aperture in the tissue is closed by the epithelium. The epithelium frequently sinks to the bottom, in perforating wounds under certain circumstances to Descemet's membrane, and frequently extends far into the interlammelar spaces. Mitoses appear in the epithelium at the end of twelve hours. The cells appear in the parenchyma in the region of the wound at first diminished in number, but there soon appears a migration of such cells into the subepithelial space. This migration is most distinct where the epithelium is in direct apposition with the cut surface. These cells are in direct protoplasmic connection with the corneal corpuscles, are doubtless to be regarded as derivates, and multiply by direct segmentation. Frequently they break down through segmentation into rows of cells that lie one behind another like a string of pearls. This proliferation takes place very early in the spaces in the parenchyma, and a migration commences. Epithelial and connective tissue cells are always sharply differentiated; transition forms can be found nowhere. Therefore it is extremely improbable that epithelial cells, or their derivates, take part in the new formation of connective tissue.

VON DER HEYDT (25, **Microscopy of the living eye with the slit lamp of Gullstrand**) describes the use of the streoscopic-binocular microscope in connection with illumination which has greatly increased its efficiency. Light from a nitrogen lamp is passed through a narrow slit diaphragm and then focussed upon the eye by means of a lens. By varying the combination of lenses in the microscope, magnification even to 108 times may be obtained. Among the interesting observations detailed may be mentioned—blood vessels at the limbus seen as vascular loops generally empty, nerve fibers of the cornea which are medullated for a short distance from the limbus, and also the individual cells on the posterior surface. In interstitial keratitis blood vessels were seen with the current of red cells rolling along. In arcus senilis the clear zone is only superficial for the opacity extends to the sclerocorneal junction in the deeper layers. The dilatation of the pupil is accompanied by a rolling up of the pupillary edge and the stroma of the iris is beautiful when seen in perspective. By using the contact glass of Koeppe the fundus may be seen stereoscopically with a magnification of about 40 times. This method of clinical observation seems likely to disclose many new facts. ALLING.

KRAUPA (20, **Crescentic absence of the scleral band as a deviation from the usual condition of the corneoscleral margin**) has observed in many eyes that the sclera does not overlap the cornea in the usual way at the limbus, but that on the contrary this place is occupied by clear, transparent corneal tissue. This occurs only in the region of the palpebral fissure, never above or below. The exact anatomical condition has not yet been determined.

KUBIK (21, **Anatomy of the angle of the anterior chamber**) calls attention to some peculiarities in the anatomy of the angle of the anterior chamber in the human eye which have until now attracted little or no notice. Certain of his preparations show a distinctly developed uveal framework. The site of Schlemm's canal varies; in one preparation it was extremely far forward, immediately contiguous to the anterior chamber, in another it lay deep in the sclera at the level of Müller's muscle. Both preparations were made from emmetropic eyes. The scleral framework contains a quantity of particles of pigment which varies according to the age of the examined eye and becomes considerable in old age. The bearing of this fact upon the ætiology of glaucoma is briefly discussed. Schlemm's canal was absent in the preparation of an eye with congenital coloboma.

FRIEDE (18, **Congenital scleral cyst with choked disk**) describes a peculiar case of congenital scleral cyst which differs in some respects from those hitherto recorded. It started 1*mm* directly below the cornea, but was not discovered until the patient was twenty years old. After this time it gradually enlarged, and finally a communication was formed over night between it and the anterior chamber. An attempt to remove the cyst was a failure.

LENZ (22, **The corpora quadrigemina in malformations of the eye**) showed a series of sections of the corpora quadrigemina in a case of congenital anophthalmos and high grade microphthalmos with coloboma of the choroid. Corresponding changes were found in another case of microphthalmos of less degree. The region of the calcarine type was very markedly shrunken. In the case of anophthalmos only the lower lip of the calcarine fissure with the adjoining base of the same showed the typical structure of the visual center. In both cases of microphthalmos there was no differentiation from the occipital to the calcarine type in the posterior two thirds of the base of the calcarine fissure. The writer comes to the following conclusions: 1. The area of the calcarine type is the central representative of the retina. 2. This area shows malformations not hitherto described which are analogous to those of the eye. 3. The conditions found in microphthalmos indicate that the faulty development of the bottom of the calcarine fissure is the cause of the great reduction or absence of central vision.

GIFFORD (19, **Trichomycetes in ophthalmology**) obtained cultures of leptothrix from three cases of chronic conjunctivitis showing involvement of the Meibomian glands out of which some secretion could be expressed. He gives a complete view of the literature and a table exhibiting the characteristics of the organism. He thinks the group of leptothrices includes not less than two and probably more distinct species.

ALLING.

SANTOS-FERNANDEZ (24, **Measurements of the nasal canal according to the race**)demonstrates the fact that lacrimal disease is more common in the colored than in the white races. He attributes this to the difference in the construction of the lacrimal canal. He has found by measurements of fifteen skulls of negroes and nine of white men that the canal is shorter, wider, and straighter in the negro. ALLING.

IV.—THE SENSE OF SIGHT, REFRACTION, AND ACCOMMODATION.

27. BEST. **Central disturbance of the color sense.** *Kong. f. inn. Med.*, Dresden, April, 1920.

28. ENGELKING and ECKSTEIN, **New colored objects for clinical perimetry.** *Klin. Monatsbl f. Augenh.*, May, 1920, p. 664.

29. ENGELKING, E. **Perimetry with physiologically colored objects.** *Ophthalmic Society of Heidelberg*, August 5–7, 1920.

30. FERREE, C. E., and RAND, G. **Sensitivity of illumination scale for determination of exact amount and placement of correction for astigmatism.** *American Journal of Ophthalmology*, January, 1921.

31. HESS. **Problem of red-green blindness.** *Ophthalmic Society of Heidelberg*, August 5–7, 1920.

32. KÖLLNER. **A new law of localization of direction and its importance to the one-eyed.** *Ibid.*, August 5–7, 1920.

33. LÖHLEIN. **The influence of psychical factors in the testing of vision of little children.** *Ibid.*, August 5–7, 1920.

34. REMAK. **Acute transitory myopia.** *Zeitschrift f. prakt. Augenheilk.*, Nov.-Dec, 1920, p. 700.

35. WESTPHAL. **A case of blindness without demonstrable changes in the optical apparatus.** *Zeitschrift f. Augenheilk.*, xxxiv., p. 92.

HESS (31, **Red-green blindness**) has devised six different new methods for the measurement of the difference between the red blind, or protanopes, and the green blind, or deuteranopes. All six methods lead to the same result, that the red blind differ from the green blind essentially through a not inconsiderable undervalence for blue and yellow, which, among other things, finds expression in a notably contracted field for blue and yellow and a measurable elevation of the specific blue-yellow threshold in the entire area of the retina sensitive to colors. Of special importance is the finding that the green blind, as regards their blue-yellow perception, in part tally with the normal, in part show a considerable overvalence for blue and yellow, which expresses itself through specially large blue-yellow fields. The red blind thus stand between the green blind and the totally color blind. This explains some of the things which have hitherto been very hard to understand. It is shown that the value curves for red in the red blind and the green blind are wholly the expression of a different blue-yellow valence.

BEST (27, **Central disturbance of the color sense**) locates a center for the color sense in the calcarine cortex on the outer surface of the left occipital lobe. When color blindness is not complete, black, white, and red can usually be perceived, the colors which are first noticed by the growing child. Furthermore the combination of color blindness with word blindness is not uncommon in weak-minded children.

The characteristics of the perimetric objects of ENGELKING (28 and 29, **New colored objects for clinical perimetry**) are 1, the peripheral value of all four colors is the same as the gray of the background of the perimeter; 2, each two colors forms a complementary pair of equal physiological saturation; 3, the four "invariable" tones are selected. The limits of the field within each pair coincide; the immediate transition from gray to color is easily perceived and accurately stated even by the unpracticed. By doing away with the light contrast in this procedure, the color limits, especially for blue and yellow, lie comparatively far in the periphery, in spite of the relatively slight objective saturation of the colors. The limit for white is not materially smaller than with the ordinary "black" perimeter. The peripheric balance of the colors also enables a test to be made of the central color sense without the influence of light contrast. As the difference of the twilight standards is comparatively slight, with the exception of the green, changes of the external illumination are generally not disturbing to the perimetric examination, and considerable fluctuations can naturally bring out the evenness of the periphery and the identity of the visual fields within the pairs of colors. The invariability is preserved under physiological conditions. Clinical experience confirms the presupposition, theoretically evident from the choice of tones, that in deuteranopes and protanopes the red and green visual fields are wanting, with the so-called anomalies contracted. With protanopes and protanomalies the light changes become conspicuous. In both congenital and acquired disturbances of the color sense these objects practically correspond to the neutral places of the spectrum. For progressive concomitant disturbances of the color sense (progressive red-green blindness) Engelking's red and green form the poorest, his blue and yellow the best pair among all possible colors; this indicates a special sensibility to the physiological objects. Invariability and evenness of periphery remain; the limits for red and green coincide and show that in these diseases the sense of red and green declines in equal degree and at the same time. The relative position of the limits of pair to pair on the contrary appears to be very variable. The conditions of brightness which are considered normal are recognized by those with acquired total color blindness, but not by those with congenital. In classical cases of acquired tritanopia the visual field for blue and yellow is wanting. At the same time both colors undergo typical changes of brightness. Blue particularly is perceived as very dark. If the neutral zone, as is often the case, has a somewhat different position in the spectrum, farther toward the short-waved portion, not only the colorless brightness, but also the invariability of the colors mentioned will be done away with; yellow appears faintly reddish, blue greenish, and also very dark. This phenomenon may be considered pathognomonic for tritanopia. The use of dark adaptation has advantages in disturbances of the color sense. The relatively great brightness of the objects together with the exclusion of all light contrasts induce a uniform tuning not to be obtained in an eye well adapted to light. Hemeralopia is not only associated with the most various kinds and degrees of acquired and congenital disturbances of the color sense, but is also met with when the color apparatus is perfectly intact.

According to Köllner (32, **A new law of localization of di-**

rection) if the direction of a distant object in the peripheral vision is tested with only one eye and pointed out on a corresponding table near the eye, there will be found to be a highly characteristic difference between the localizations in the temporal and nasal halves of the visual field. In the temporal half the localization of direction corresponds fairly accurately with the line joining the object and the eye, but in the nasal half the object will be localized much too far toward the other, not seeing eye. The following law of localization is formulated:—In the temporal half the localization of direction always corresponds to the true position of the retinal image, but in the nasal to the place where the object would be pictured on the corresponding place in the retina of the other eye if this were directed toward the point of fixation. The law may also be thus stated:—In the right half of the field of vision the localization is always fixed by the position of the right eye, in the left by the position of the left. After loss of an eye the normal way of localization persists for a long time with the characteristic difference between the two halves of the visual field, until finally the brain corrects the error in the nasal half. The appearance of this correction varies in individuals; it does not occur generally until after 4 or 5 years, and often much longer.

WESTPHAL (35, **Case of blindness without demonstrable changes in the optical apparatus**) reports the case of a girl in whom a psychosis developed after a fever, to which was added later epileptic fits and a rapid loss of vision. The behavior of the patient was that of a blind person, which the condition of the eyes, including the pupillary reactions, was perfectly normal. Westphal thinks that the cause of the blindness was organic rather than psychogenous, because there is no other known case in which a psychogenous blindness has lasted for eight years.

FERREE AND RAND (30, **Sensitivity of illumination scale for determination of exact amount and placement of correction for astigmatism**) have devised an instrument by means of which the intensity of illumination may be varied and measured. They have employed it in testing the acuity of vision by means of a broken circle, noting the least illumination with the break can be distinguished. In cases of astigmatism if the angular position of the break when seen in the faintest light be noted and the test made at 90° from this position, the amount of astigmatism and its axis can be determined. They think that the method is very delicate and might be used to supplement clinical tests. ALLING.

LÖHLEIN (33, **Influence of psychical factors in the testing of vision of little children**) calls attention to the fact that a useful test type for children unable to read is not available, although the need for it is greater now than formerly. He has been studying the following three questions on children ranging from 3 to 6 years old. 1. What influence has the size of an object, whether natural, or larger or smaller than natural, have upon its recognition by a child? 2. Is the perception of distance influenced by depicting the object in a black and white outline, or by producing a plastic effect through the use of light and shadows? 3. What influence has the presentation of an object in one or several colors, in comparison with the black and white picture? Although the observation of psychologists is confirmed, that the recognition of an image by a child is not hindered by its unnatural size, yet too large a size does render the recognition of the image relatively more difficult. The distances of ocular perception were about the same in the various emmetropic children. Presentation in the natural size, and still more in reduced size, facilitates the correct interpretation of the image by the child, because it is accustomed to see things almost always reduced in picture books, and also in daily life objects in the distance are never enlarged, but diminished. The distance of ocular perception thereby becomes greater. If an image is given the appearance of solidity by the use of light and shadows, its recognition by the child is not facilitated. The explanation given of this is that the bright stars stand out from the black background, and the outlines of the picture appear indistinctly at a greater distance, and herein is found the differentiating influence of the outline in the recognition of images by children. Even an unnatural prominence of a certain part of an image may facilitate its recognition when it seems particularly characteristic to the child, even though it might make recognition by an adult more difficult. A single colored image is no more easily recognized by a child than a black and white, but it is otherwise with the particolored image. This attracts the attention of the child greatly, who recognizes it at a greater distance than the same image with a black outline. Many things are to the child characterized by their colorings, so their recognition is easier in colored pictures than in colorless. The test types recommended are: Black and white pictures with simple or characteristic outlines without lights and shadows, of objects known to all children.

REMAK (34, **Acute transitory myopia**) reports two cases of this nature, one in a woman 22 years old, the other in a man 32 years old. In each case there was a sudden onset of two and three dioptres of myopia, which after nine and eleven days gave way to emmetropia and hypermetropia. The urine was normal in each case. Each of these cases was probably one of obstinate spasm of the accommodation.

V.—THE MOTOR APPARATUS OF THE EYE.

36. FEILCHENFELD. **Paralysis of the convergence.** *Berl. Gesellsch. f. Psychiatrie u. Nervenkrankheiten*, February 8, 1920.

37. SATTLER. **Two cases of chronic progressive ophthalmoplegia.** *Verein. f. wissenschaftl. Heilkunde*, Königsberg, January 26, 1920.

38. SCHILLING. **Contribution to the function of the vestibular apparatus.** *Arch. f. Ohren-, Nasen-, und Kehlkopfkrankh.*, civ., No. 3 and 4.

39. OHM. **Relations between vision and eye movements.** *Zeitschr. f. Augenheilk.*, xliii., p. 249.

40. OHM. **Miners' nystagmus.** *Arch. f. Ophthalm.*, ci., p. 210.

OHM (39, **Relations between vision and eye movements**) advances the theory that the ampullar mechanism of innervation is so complete for the coördinate movements of the eyes that there is no compulsion to assume the existence of a special supranuclear coördinating center. He believes the true coördinating center to be located in the vestibular nucleus. The ampullar mechanism of innervation is brought into activity by stimulation of the periphery of the retina and acts in a more or less reflex manner to change the position of the fovea, though not against the will. It is not only the intensity of the retinal stimulation, but also the sharpness of the picture, which exerts its influence upon the eye movements.

OHM (40, **Miners' nystagmus**) says that an ordinary well marked nystagmus may develop in other miners than those of coal in the middle of the second year of their work. In one case he found a very faulty adaptation to dark, in another a hereditary predisposition to nystagmus. A certain familial predisposition cannot be doubted, so young relatives of a family in whom several cases of nystagmus are to be found should be warned not to engage in mining. He thinks that high myopia predisposes to nystagmus, although it is in no way an essential cause. As regards the duration of the trouble, he has seen one case in which the nystagmus persisted for six years after the occupation had been given up, though commonly it disappears after one or two years.

In FEILCHENFELD'S (36, **Paralysis of the convergence**) case the internal recti functionated normally in lateral movements of the eyes, but failed to act in convergence. One eye fixed an object while it was brought near while the other remained parallel. The convergence reaction of the pupils was likewise absent. The accommodation on the contrary was for the most part preserved, but only when the second eye was excluded from the act of vision.

In one of SATTLER'S (37, **Two cases of chronic progressive ophthalmoplegia**) cases the patient had bilateral ptosis and limitation of the movements of the eyes in all directions, most marked upwards. There was no myasthenic reaction, and the Wassermann was negative. The patient gave a history of having received a blow. In the second case there was an almost complete loss of movement of the eyes with a slight inward deviation. The pupils were of equal size, reacted to light but not to convergence. The optic nerves were atrophic. Wassermann test of the blood negative, of the spinal fluid positive. The rare symptom of absent reaction to convergence with preservation of reaction to light he ascribes to the fact that the convergence was in great measure, and the accommodation wholly paralyzed. In the first case the vestibular reaction of the ocular muscles could not be demonstrated, there was no vestibular nystagmus, but in the second case, in which the destruction was not so great, it was demonstrable.

VI.—THE LIDS AND LACRIMAL APPARATUS.

41. BROWNLIE, W. BARRIE. **A case of infection of the lacrimal sac, maxillary antrum, pharynx, tonsils, mouth, and parotid gland with blastomycetes albicans.** *Zentralbl. f. Laryng. u. Rhinologie*, 1920, p. 9.

42. Ferreri. **Dacryocystorhinostomia externa and interna.** *Zentralbl. f. Rhinologie*, 1920.

43. Heermann. **The influence of West's operation on the course of inflammations of the lacrimal sac.** *Klin. Monatsbl. f. Augenheilk.*, lxiv., p. 536.

44. Heuser. **Carcinoma of the lids.** *Dissertation*, Giessen, 1919.

45. Johnsen. **Plastic restoration of the nose and of the eye.** *Zentralbl. f. Chir.*, 1920, p. 62.

46. Mertens. **Congenital ectropion of the upper lids.** *Zeitschrift. f. Augenheilkunde*, liii., p. 565.

47. Withers, S. **Carcinoma of the eyelids treated with radium.** *American Journal of Ophthalmology*, January, 1921.

Withers (47, **Carcinoma of the eyelids treated with radium**) has treated over a hundred cases of carcinoma occurring about the eyes and presents the histories of eight showing usual and unusual features. In making the applications the eyeball is generally protected by a lead screen which, when covered with paraffin, may be introduced into the conjunctival sac. The radium was enclosed in a silver tube and gum rubber was interposed between the lesion and the applicator. The average dosage was about 100*mgm* hours, per square *cm* of the area treated. Results lead the author to conclude that radium is the method of choice over surgical proceedures.
Alling.

Heuser (44, **Carcinoma of the lids**) completes Mayeda's review of the cases of carcinoma of the lids met with in the Giessen clinic from 1901 to 1919. The average number of cases per year is 3.3. It occurs with comparative frequency in young life, the left eye is the more often attacked, the cancer grows slowly, usually in the direction of the nose. The absence of swelling of the lymphatic glands is striking. The best treatment, according to the experience in Giessen is the radical operation, the incision being made at least 1*cm* distant from the growth in healthy tissue. The improvement obtained from roentgen or radium rays, or from carbonic acid snow, often are only superficial; the surface heals, but the growth proliferates deeper, so that later extensive operations are rendered necessary. The danger of recurrence is less than in other forms of cancer, 20 in 60 cases. A case should be pronounced cured only after five years of observation.

Johnsen (45, **Plastic restoration of the nose and of the eye**) supports eyelids which are too weak by the implantation of bits of cartilage from the ribs. When the conjunctival sac is too small he divides it horizontally in the middle, dissects the conjunctiva back, fastens it with quilt sutures, and covers the central defect with a Thiersch flap. He has restored an entirely destroyed lower lid by means of a pedicled flap from the brow strengthened with cartilage.

In MERTENS'S (46, **Congenital ectropion of the upper lids**) case the upper lids were found completely everted immediately after birth, while the transition folds were so swollen that the normal eyes could be made visible only by means of an elevator. He ascribes the condition to a spasm of the lids aided perhaps by some traumatism during birth.

The infection in BROWNLIE'S (41, **Infection of the lacrimal sac, antrum, and other tissues with blastomycetes albicans**) 41-year-old patient started in the lacrimal sac and spread through the nose, mouth, and parotid, gland down into the neck. The mucous membranes were covered by a yellowish-white, tenacious mucus. A tenacious clear mucus could be blown out of the accessory sinuses. General examination negative. A radical operation on the antrum revealed a marked change in the bony wall.

FERRERI (42, **Dacryocystorhinostomia**) shows that endonasal operations are not indicated in all cases, and possess no advantages over Toti's operation. The latter is particularly superior when dealing with traumatic diseases of the lacrimal sac.

HEERMANN (43, **Influence of West's operation on the course of inflammations of the lacrimal sac**) considers the results of West's operation so good that no other treatment can compare with it. This is because the normal function of the lacrimal apparatus with a constant flow from the conjunctival sac is attained. He reports ten cases in which the operation was followed immediately by a free flow into the nose and subsidence of the inflammation. It was more difficult to keep the passage open, which often necessitated further operations. He does not think that West's suggestion, that the bony window should be made larger than that through the mucous membrane and periosteum, in order to avoid this trouble, is always feasible.

(*To be continued.*)

BOOK REVIEWS.

VIII.—**Chirurgie de l'Œil et de ses Annexes.** By F. Terrien. II. edition enlarged and revised. Masson & Co., Paris, 1921. Price 50 fr.

The author in the first edition essayed to present his subject by drawings rather than by text, and this successful feature is just as predominant in this new edition of the various operative steps.

Terrien regards the following new discoveries in the field of ophthalmic surgery as important. The principal one is sclerectomy, which we owe to Lagrange and which has improved the prognosis of glaucoma. The technic of cataract extraction has been elaborated with advantage by the corneal suture and the conjunctival bridge, which aim to reduce the danger of certain complications and assure a better final result. Extraction in the capsule, in the author's opinion, notwithstanding Barraquer's ingenious technic, is still too complicated to be recommended. Certain forms of secondary cataract are now better treated by the use of the punch forceps. Conjunctival plastic is of value in combating infection of wounds of the eyeball. Advances have been made in correcting ptosis, in operations on the ocular muscles, on the orbit and on extraction of intraocular foreign bodies.

The general arrangement of the book remains the same.

A few of the salient features in this excellent book are the following: In thick secondaries the author prefers to seize the anterior capsule with Terson's capsule forceps rather than to grasp the entire capsule anteroposteriorly, as was formerly advocated by Panas. The punch forceps of Vacher gives a regular and definite pupillary opening in thickened secondaries.

The Lagrange sclerectomy has been modified to lessen the danger of subluxation of the lens, loss of vitreous, and to facilitate the scleral resection as follows:

(a) After dissecting a conjunctival flap as in trephining, a semilunar scleral segment is cut with the knife and flap is sutured.

(b) The scleral resection is done with a punch. This instrument removes a piece out of the entire thickness of the sclera after incision with the keratome, thus reducing the size of the scleral wound. This method Terrien prefers to the Lagrange technic if trephining is not indicated. The first step is done with a knife or the keratome. The latter is preferable.

The point of the keratome enters the conjunctiva 10*mm* above the cornea and passes forward subconjunctivally to penetrate the sclera 2.5*mm* from the limbus and so enters the anterior chamber. The conjunctival flap is then freed from the scleral incision to the limbus. The entire conjunctival flap dissection can be made with the scissors and the scleral incision is then made with the keratome as above. The scleral resection is then made with the punch forceps.

Trephining accomplishes what sclerectomy does with greater ease, without danger, and always with an identical result, and in the author's opinion should be the rule in chronic glaucoma.

After enucleation a graft consisting in a piece of costal cartilage is inserted in Tenon's capsule, to which each of the detached recti muscles is sutured, or a pediculated subcutaneous graft (Lagrange) is inserted. Finally, in the simple enucleation the artificial eye is better borne by the additional insertion of a rubber shell or a temporary wax moulage. Contracted sockets can be dilated by wearing shells (olives) of increasing size.

In ptosis if some action of the elevator remains, the author advises advancement of the elevator according to the technic of de Lapersonne, otherwise an anastomosis of the elevator to the occipitofrontalis or the Motais operation are best.

Lumbar puncture is described. Finally in tumors of the hypophysis organo-therapy and radio-therapy are recommended.

A. K.

IX.—**Augenärztliche Eingriffe (Operations on the Eye).** By Professor J. Meller, Director of the First Eye Clinic in Vienna. II. edition, 219 illustrations in the text. Vienna and Leipzig, Josef Safar, 1921.

The new edition of Meller's text-book, which is well known in this country, as it appeared in an English translation by Dr. W. M. Sweet in 1912, has been rewritten and enlarged by the addition of new material. The book is dedicated to Professor Fuchs, who has just celebrated his 70th birthday and of whom an excellent portrait is appended.

The plan to give only the operations which the author himself practices and therefore approves of, is maintained in this edition. This is undoubtedly the best for the student and the confusion resulting from a description of many methods of operating is avoided.

The book begins with a description of the author's excellent method of extirpating the tear sac. A cure with no tearing occurs in about half of the cases of dacryocysto-rhinostomia. Meller is not convinced of the superiority of the results of the West or the rhinological method of operating. In the Krönlein resection of the outer bony wall of the orbit the author uses the Gigli wire saw for the lower incision and a straight saw for the upper. In the extraction of senile cataract a toothed capsule forceps is used. Irrigation of the anterior chamber the author believes to be unnecessary and to do more harm than good. The cataract is then expressed by pressure with the finger acting through the lower lid. Extraction without iridectomy means an optical advantage for the eye. The tendency to iris prolapse is obviated by a small peripheric iridectomy. The author prefers trephining to the Lagrange sclerotomy operation, though owing to the danger of late infection these operations are only justified where iridectomy is dangerous and where sclerotomy or cyclodialysis are not applicable. Meller finds that cyclodialysis gives satisfactory results in only about 20% of the cases.

In keratoconus trephining of the apex of the cornea gives the best results.

These are only a few of the excerpts from this excellent text-book. The clearness of the text, the splendid illustrations, the definite directions in the management of the instruments, the exact indications and the careful after-treatment, with a discussion of the various complications, make this a manual which can be recommended not only to the student but to the experienced operator. It is to be hoped that an English translation will soon be available.

A. K.

X.—**Traité Complet de Thérapeutique Oculaire** (Ocular Therapeutics). By Dr. A. Darier, Paris. 725 pages. Jouve et Cie, Paris, 15 rue Racine. 1921.

This is an enlarged edition of the author's well-known book which appeared in 1901. As therapeutics depends on diagnosis, the author describes and draws attention to the importance of the slit lamp of Gullstrand and the ophthalmoscopic examination with the red-free light of Vogt. Mention is made of recent progress in the sero-diagnosis of syphilis, of tuberculosis, of gonococcal infections, etc., the use of serums and vaccines, the so-called paraspecific treatment and the parenteral injections of boiled milk.

The book is divided into two parts: the first is on general therapeutics and comprises the following chapters: (1) Importance of an exact ætiological diagnosis; (2) Biologic therapeutics (immunization, passive and active); (3) Modes of applying medicaments; (4) General treatment; (5) General treatment employed in ophthalmology; (6) Physical agents; (7) Local ocular applications. Part two is on special therapeutics in diseases of the eyelids, lacrimal apparatus, conjunctiva, cornea, and sclera, iris and ciliary body (sympathetic ophthalmial glaucoma, lens, choroid, retina and vitreous body and optic nerve. An index of diseases and their treatment and therapeutics notes on the remedies used in ophthalmology conclude the volume.

According to the author a good therapeutist must possess self-confidence and enthusiasm, tempered by a critical mind and by a certain degree of skepticism. The laboratory must serve as a control for clinical observation but the proper relation between experimental facts and carefully observed clinical observations must always be preserved.

The author has given us an exhaustive treatise on ocular therapeutics. This is a great help to every practicing ophthalmologist who will receive many valuable suggestions, just as the mere recapitulation of the known methods of treatment in any diseases is at times of value.

A review without speaking of Dr. Darier's style of writing would be incomplete. It is lucid, interesting, often suggestive, and always optimistic. A. K.

XI.—**The Psychology of the Special Senses and their Functional Disorders.** By Dr. Arthur F. Hurst. 123 pages. Oxford University Press, Henry Frowde. Hodder & Stoughton, London, 1920.

This little book is an attempt to explain the nature of hysteria, with a description of its various types—especially as it manifests itself through interference with the proper functioning of the special senses.

The material which forms the subject matter of the book was obtained through a study of the various neuroses which developed under the strain of the great war.

Babinski's observation that hysteria is always the result of suggestion is accepted as correct, though in some cases there may be other contributing causes. After defining hysteria as "a condition in which symptoms are present which have resulted from suggestion and are curable by psychotherapy," he devotes the first six chapters to a discussion of disturbances of the skin and mucous membranes, and of the superficial reflexes, due to hysteria.

Five classes of hysterical anæsthesia are described:

1. Anæsthesia following hetero-suggestion—the suggestion almost always being given by the examining physician.

2. Anæsthesia following stupor. A soldier is stunned, and thereafter ceases to pay attention to anything except what is uppermost in his mind. The various anæsthesias then develop from inattention.

3. Anæsthesia following injury to a peripheral nerve, but persisting after the nerve has healed.

4. Anæsthesia following cerebral or spinal lesions, but persisting after partial or complete recovery from the injury.

5. Anæsthesia following local anæmia (due to exposure to cold, etc.) but persisting after recovery.

All these classes of anæsthesia are described as being due to hetero- or auto-suggestion. The author's explanation of the process by which anæsthesia develops after it has been suggested is that the individual simply ceases to pay attention. Shock, extreme exhaustion, etc., are, of course, predisposing factors. In order to feel, one must pay attention; in order to see, he must look. He ceases to attend, to listen, to look, and therefore believes that he cannot. A cure is brought about by convincing him that he can.

The pathogenesis of disturbances of the superficial reflexes is explained on the neuron theory first suggested by Duval and Cajal in attempting to explain the cause of sleep. The theory assumes that the terminal arborizations of afferent nerves are in actual contact with the dendrites of cells in the cerebral cortex—that these latter are contractile, and during sleep withdraw, thus interrupting centripetal impulses. The author assumes that during the inattention of hysteria there occurs an increased resistance at the synapse, due either to a withdrawal of the dendrites or a physico-chemical change, thus blocking the reflex path. It should be remembered that this theory is not supported by experimental evidence.

Hysterical hyperæsthesia, hysterical pain, and hysterical hyperaceusis are explained as being due to a diminished resistance at the synapse, a more perfect union of the nerve terminals, thus making the passage of centripetal impulses easier. This condition is brought about, not by inattention, but by paying too much attention to injuries, either real or imaginary.

The chapters on hysterical deafness and hysterical blindness are especially good. It is interesting to note that the author denies that the contracted or spiral field of vision is typical of hysteria.

Many excellent case histories are cited which fully illustrate the various types of the disease and the appropriate treatment in each case.

A. H. T.

XII.—**Manual of Ophthalmic Operations.** By F. P. MAYNARD, Lieut.-Col. I. M. S., Calcutta. II. edition. 248 pages, 6 plates and 137 illustrations. Edinburgh. E. & S. Livingston, 1920. Price, 21s. net.

This is a clearly written and well illustrated description of the usual operations performed on the eye. It will undoubtedly serve as a useful guide to those called upon to do eye operations, particularly in India. In preparing the patient's conjunctiva the author uses a 1 to 5000 mercuric iodide of potassium solution in the form of irrigation and swabs. The instruments are sterilized by boiling in a 2% sodium carbonate solution for fifteen minutes, except the knives, which are washed with wool soaked in absolute alcohol. A well-fitting pad and a protective bandage are applied after operations. The author favors iridectomy for acute glaucoma and trephining in the chronic: the latter operation is "straightforward and fairly easy." One case of late infection was observed in some hundred operations. The description of the cataract operation is the usual one with the use of either capsule forceps or cystotome. Extraction in the capsule "is not possible without running many risks which in the author's opinion are not always justifiable," and "until a better method of expression is devised the capsulotomy or capsulectomy operations will continue to obtain preference." The operations on other parts of the eye are conservatively selected and follow the methods usually described and practiced.

A. K.

XIII.—**Manual of Ophthalmic Practice.** By F. P. MAYNARD, Lieut.-Col. retired, Calcutta. 316 pages, 12 plates and 133 illustrations. Edinburgh. E. & S. Livingston, 1920. Price 25s. net.

This is intended for students and junior practitioners and is based on lectures delivered at the Medical College, Calcutta. After a careful description of the methods of examining the eye, the various structures of the eye are taken up in the usual order, giving their anatomy, physiology, diseases, and treatment. The text is clear, elementary, and illustrated with a judicious selection of drawings from well-known textbooks, with some original photographs which have unfortunately not reproduced well, and with some excellent colored plates.

A. K.

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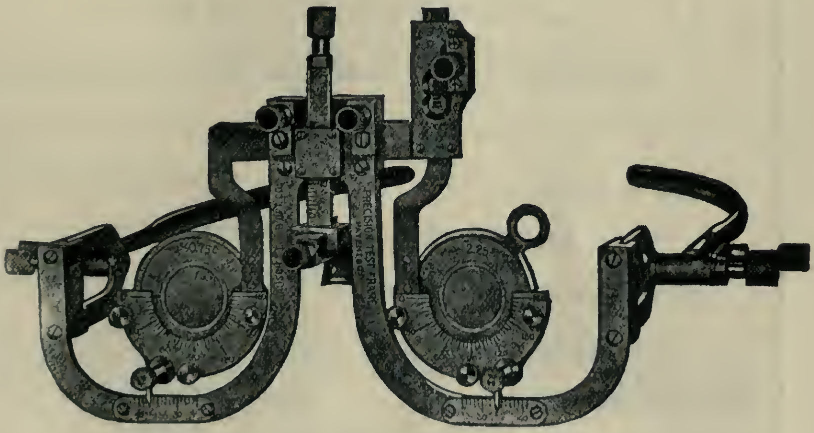

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This explan. page to face plate 1

EXPLANATION OF FIGURES ON PLATE I.

FIG. 1. Marked pigmentation of the epithelial layer of the limbus. Not only the epithelium of the limbus, but also of the cornea to Bowman's membrane is pigmented. The number of the pigmented epithelia in the latter is 7. Zeiss DD, Komp. Ok. 6.

FIG. 2. A surface section of the limbus. The netlike arrangement of the elevations of the tunica propria are here unmistakable. Leitz 3, Ok. 3.

FIG. 3. A section from the limbus of a vital stained rabbit's eye. The cells with granules are Kiyono's histiocytes. The granules are black instead of red. Zeiss DD, Komp. Ok. 4.

FIG. 4. Marked pigmentation of the epithelial layer of the limbus; almost all the epithelia are laden with pigment. Chromatophores are to be seen in the subepithelial layer. Zeiss DD, Komp. Ok. 6.

ILLUSTRATING DR. KAZUO HIWATARI'S ARTICLE ON "HISTOLOGY OF THE REGION OF THE CORNEOSCLERAL MARGIN."

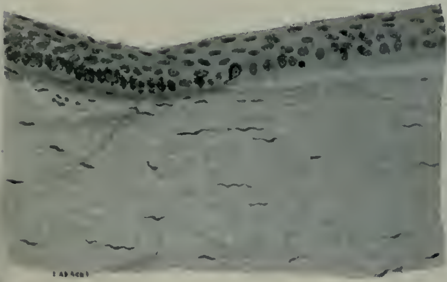

FIG. 1.

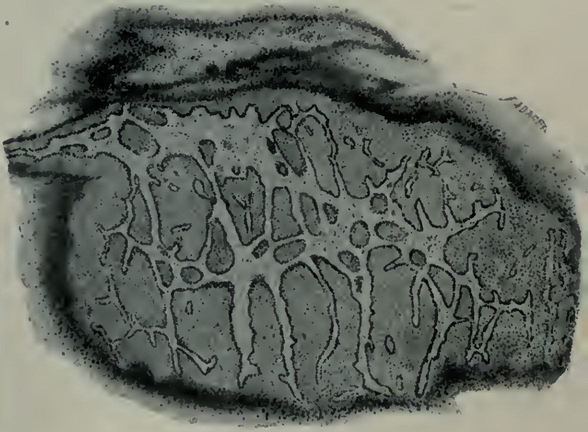

FIG. 2.

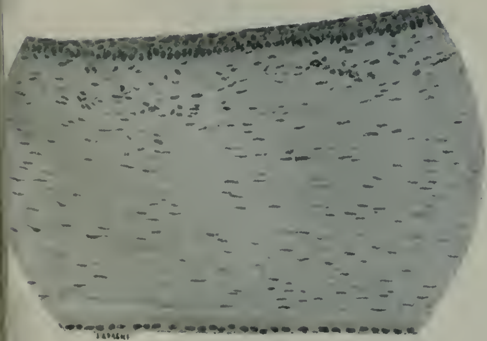

FIG. 3.

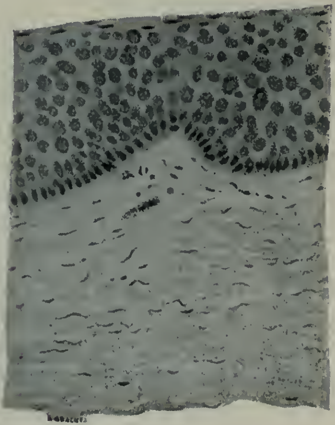

FIG. 4.

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"METASTASIS OF CARCINOMA INTO AN ENDOTHELIOMA OF THE
OPTIC SHEATH."

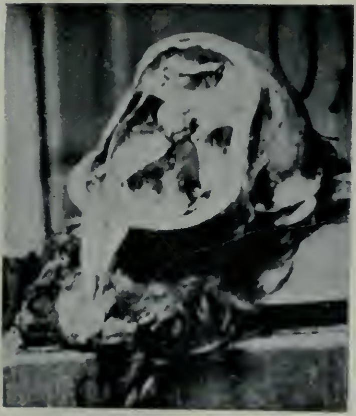

FIG. 1.

Photograph of the opened cranium, showing the rounded tumor at the left optic foramen.

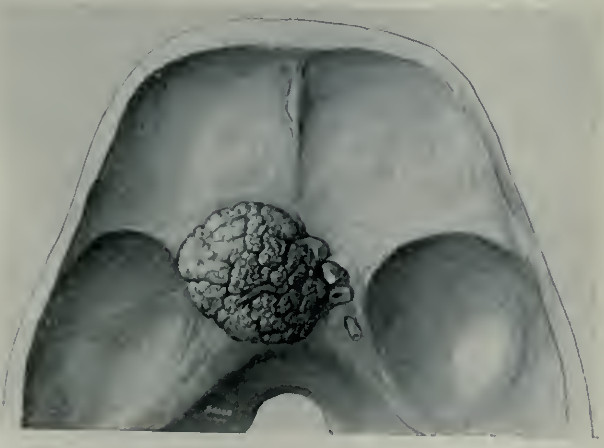

FIG. 2.

Drawing of the rounded tumor of the left optic sheath *in situ*.

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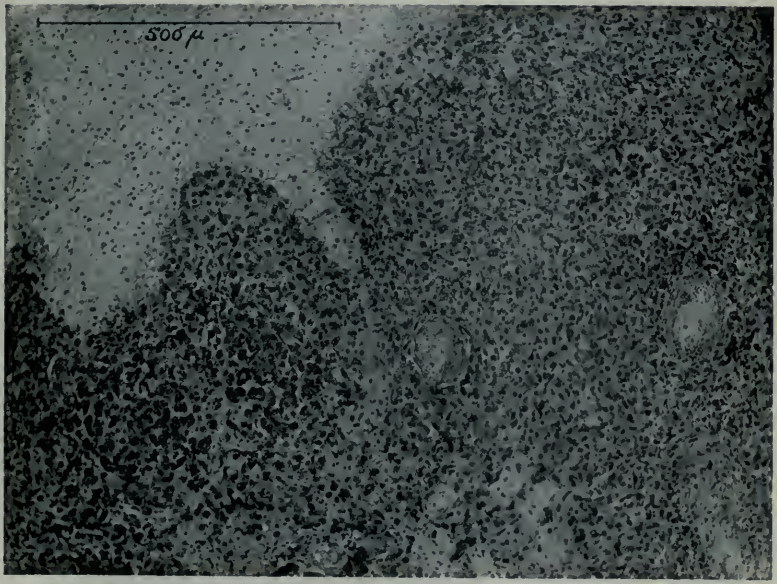

FIG. 3.

Section of metastatic tumor in the cerebral substance. (Photomicrograph.)

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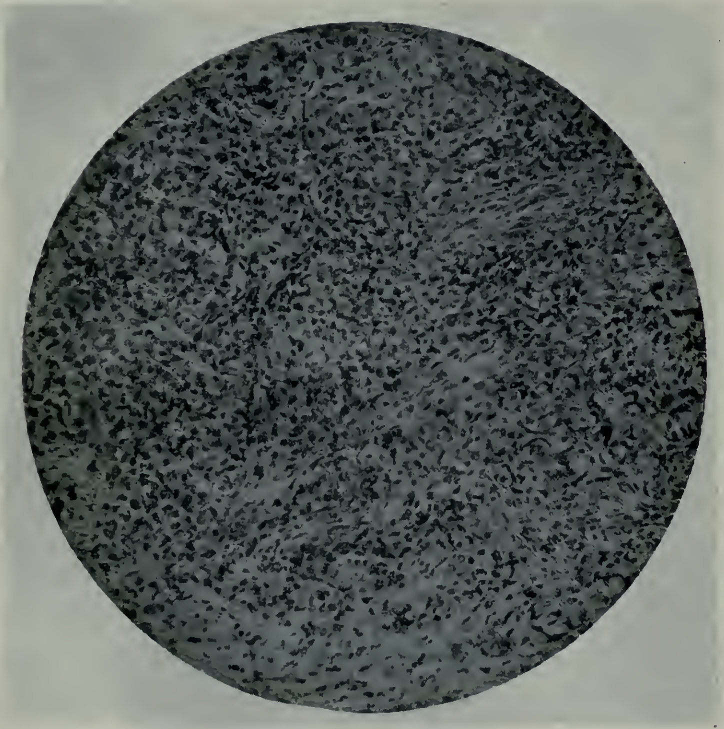

FIG. 4.

Section of the primary tumor of the breast, from the Pathological Collection of the Wyckoff Heights Hospital, Brooklyn, N. Y. (Photomicrograph.)

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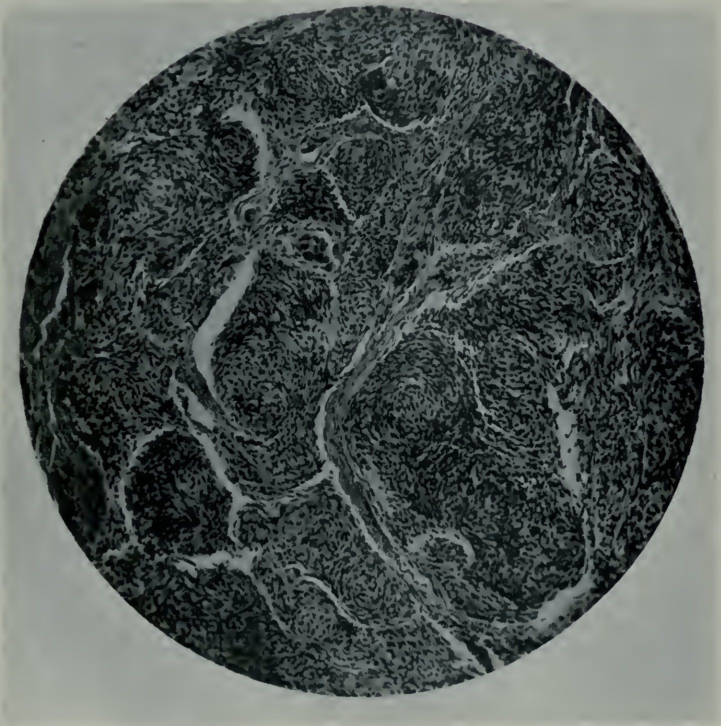

FIG. 5.

Section of the rounded tumor showing its general structure. Slightly to the left and above the center is a group of cells with large nuclei. This is a small nest of carcinoma. (Photomicrograph.)

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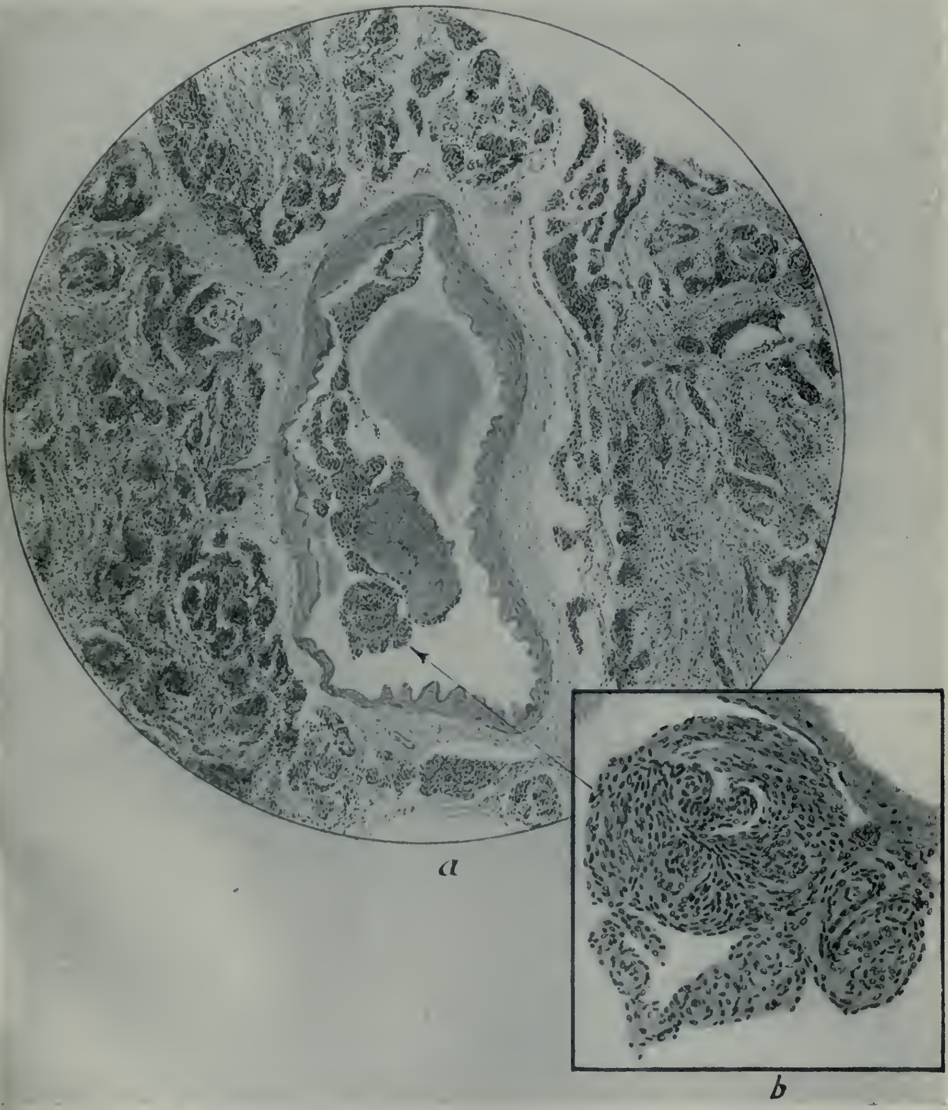

FIG. 6.

(a) Blood vessel containing a mass of new growth within its lumen. (b) A portion of the intravascular growth at higher magnification. (Drawing.)

Illustrating Drs. Martin Cohen and Ward J. MacNeal's Article "Metastasis of Carcinoma into an Endothelioma of the Optic Sheath."

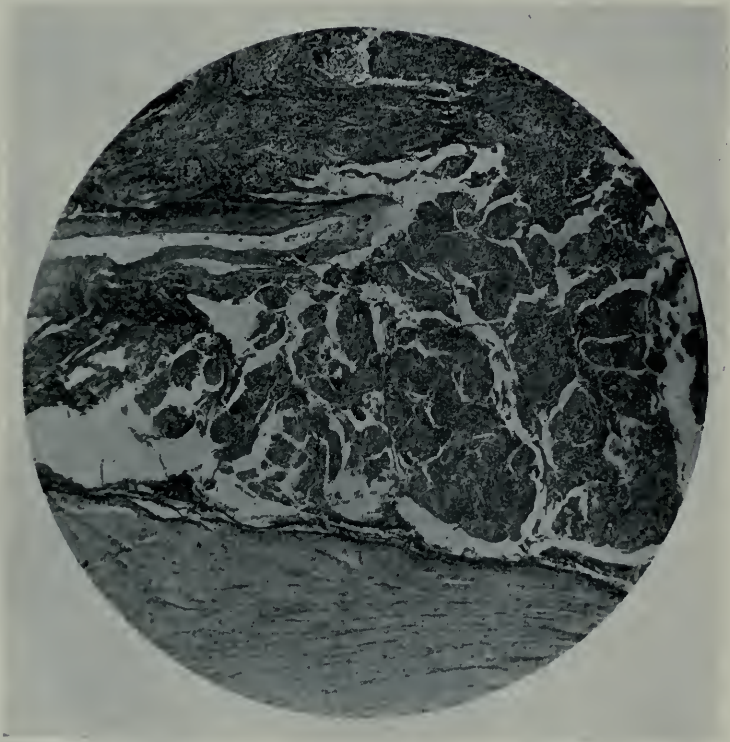

Fig. 7.

Section of the intracanalicular portion of the left optic nerve with new growth in the intervaginal space. The nerve is seen at the bottom of the picture. (Photomicrograph.)

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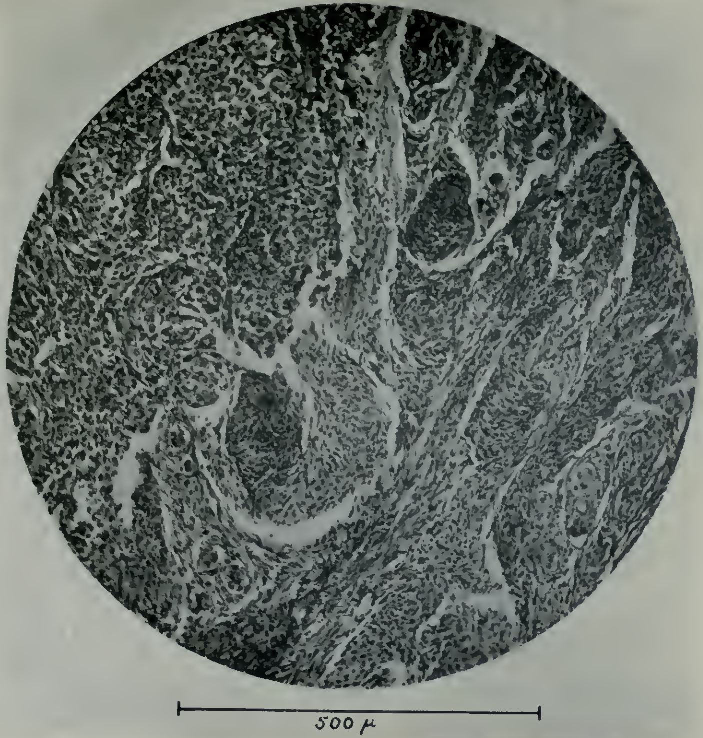


FIG. 8.

Section of the lower part of the rounded tumor showing carcinoma to the left and endothelioma to the right. (Photomicrograph.)

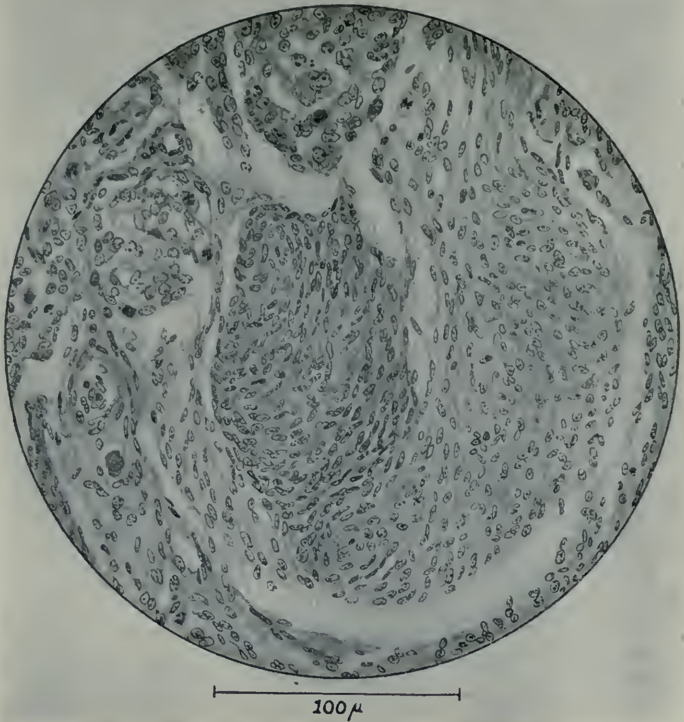


FIG. 9.

A portion of the field slightly to the left and below the center of Fig. 8, showing the border between the two neoplasms. Note the mitotic figures in the carcinoma. (Drawing.)

ILLUSTRATING DRS. MARTIN COHEN AND WARD J. MACNEAL'S ARTICLE "METASTASIS OF CARCINOMA INTO AN ENDOTHELIOMA OF THE OPTIC SHEATH."

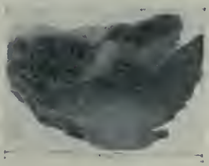


FIG. 10.

Section of the distorted intracranial end of the left optic nerve, stained by Weigert-Pal method. (Photomicrograph.)

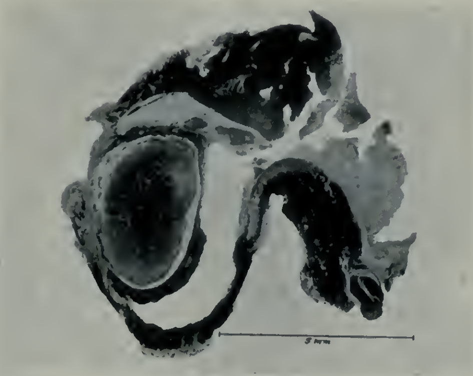


FIG. 11.

Section of the posterior end of the orbital portion of the left optic nerve, stained by Weigert-Pal method. A degenerated area is present in the superior temporal quadrant. (Photomicrograph.)

Illustrating Dr. de Schweinitz' Article on "Concerning the Ocular Symptoms in the Subjects of Hypophyseal Disease with Acquired Syphilis; with Illustrative Cases."

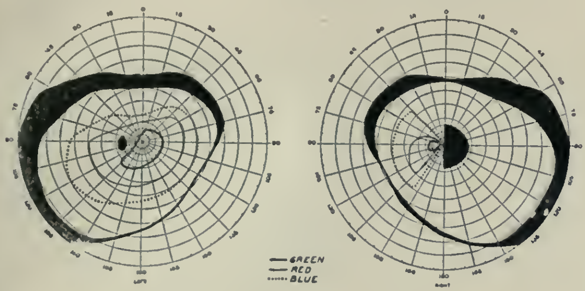


Fig. I., Case 1. June 2, 1920. *Right:* Hemianopic scotoma; temporal color hemianopsia; slight concentric contraction. *Left:* Temporal slant; partial color hemianopsia (green).

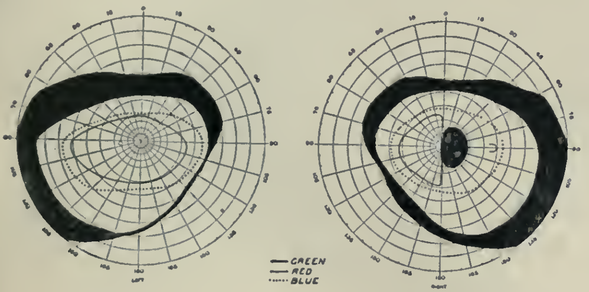


Fig. II., Case 1. June 30, 1920. Fifteen days after operation. *Right:* Restored blue field; area of red restoration on temporal side; *Left:* Moderate contraction.

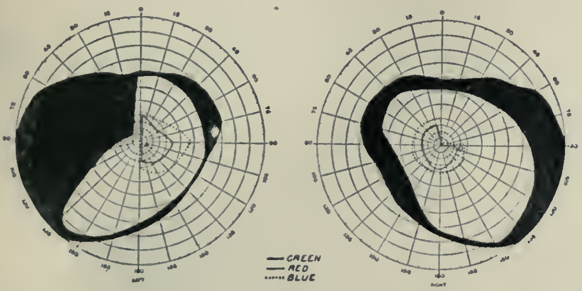


Fig. III., Case 2. December 9, 1919. *Right:* Quadrant color defect, up and out. *Left:* Complete temporal color hemianopsia; partial hemianopsia for white.

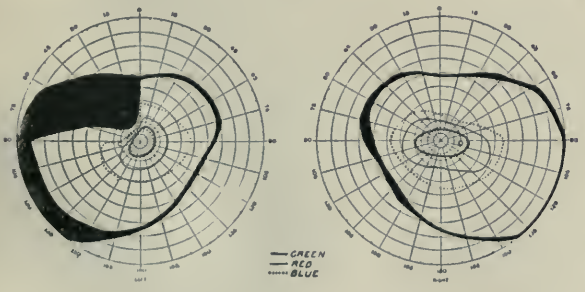


Fig. IV., Case 2. January 29, 1920. Fields after six injections of neoarsphenamine followed by mixed treatment. *Right:* Restoration of white field, loss of quadrant temporal color hemianopsia but some temporal slanting. *Left:* Partial restoration of white and color fields. Vision $\frac{6}{6}$, each eye.

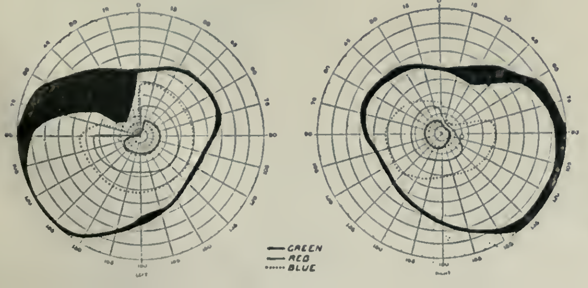
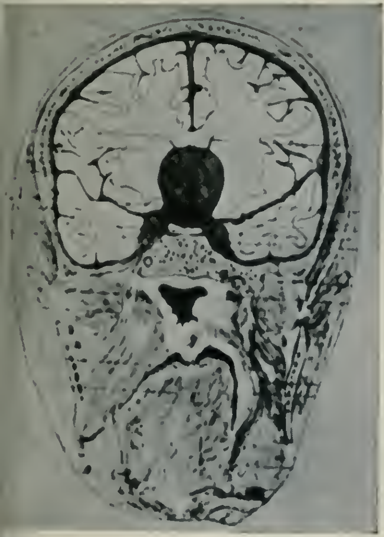


Fig. V., Case 2. April 17, 1920. Fields after relapse following cessation of treatment. *Right:* Renewal of temporal quadrant color anopsia. *Left:* Quadrant defects for white and color. Vision O. D. $\frac{6}{9}$, O. S. $\frac{6}{30}$.

ILLUSTRATING DR. CHARLES H. FRAZIER'S ARTICLE ON "THE CONTROL OF PITUITARY LESIONS, AS AFFECTING VISION, BY THE COMBINED SURGICAL-X-RAY-RADIUM TREATMENT."



IG. 1.—Pituitary cyst. Diagram-
tic representation of the proportionate
ensions of cyst exposed by a trans-
tal craniotomy. (Case 2.)

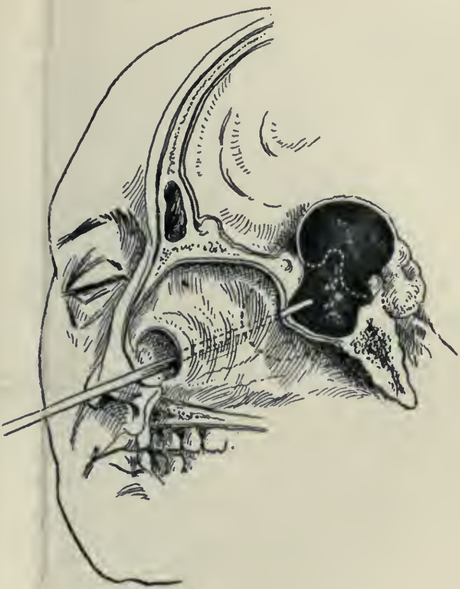
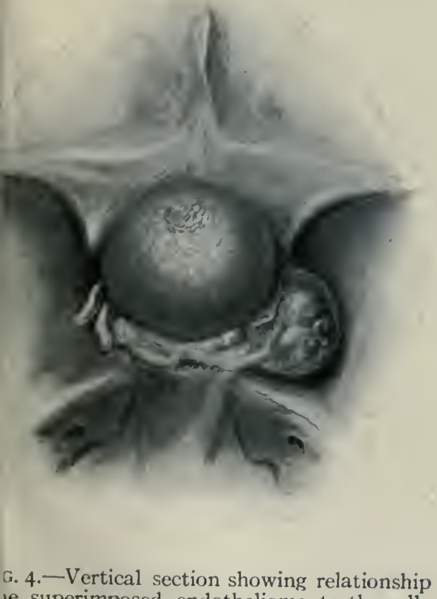


FIG. 3.—A primary endothelioma at the base of the skull, superimposed upon the pituitary fossa, viewed from above. Note the lateral extension of a secondary pituitary hyperplasia. (Case 3.)



G. 4.—Vertical section showing relationship
e superimposed endothelioma to the sella
nts. (Case 3.)

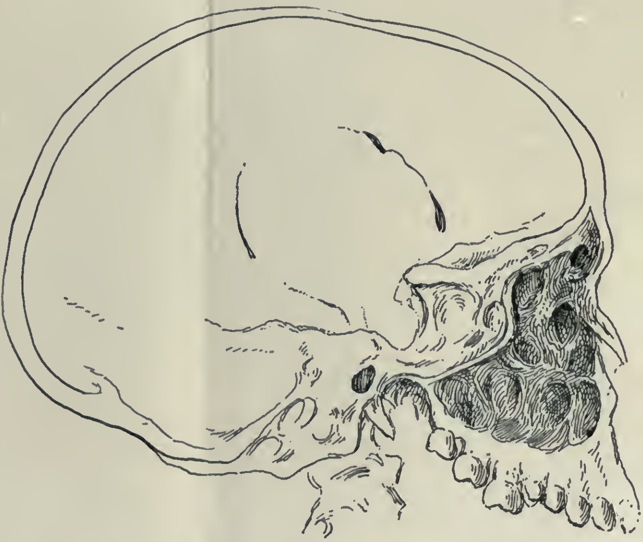


FIG. 5.—A drawing to represent the calcified wall of a pituitar cyst as revealed by the X-ray. (Case 4.)

Arch. of Ophthal., Vol. L., No. 3. *Text-Plate XII.*

ILLUSTRATING DR. CHARLES H. FRAZIER'S ARTICLE ON "THE CONTROL OF PITUITARY LESIONS, AS AFFECTING VISION, BY THE COMBINED SURGICAL-X-RAY-RADIUM TREATMENT."

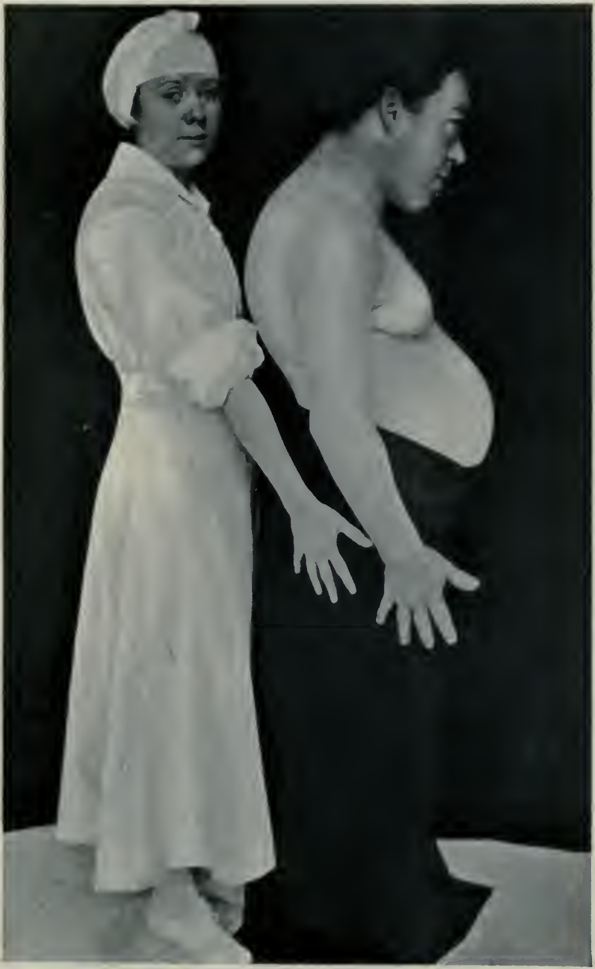


FIG. 2.—Photograph of patient showing the characteristic physical signs of dyspituitarism. (Case 3.)

Illustrating Drs. Harold Gifford and Sanford R. Gifford's Article on "Molluscum Conjunctivitis."

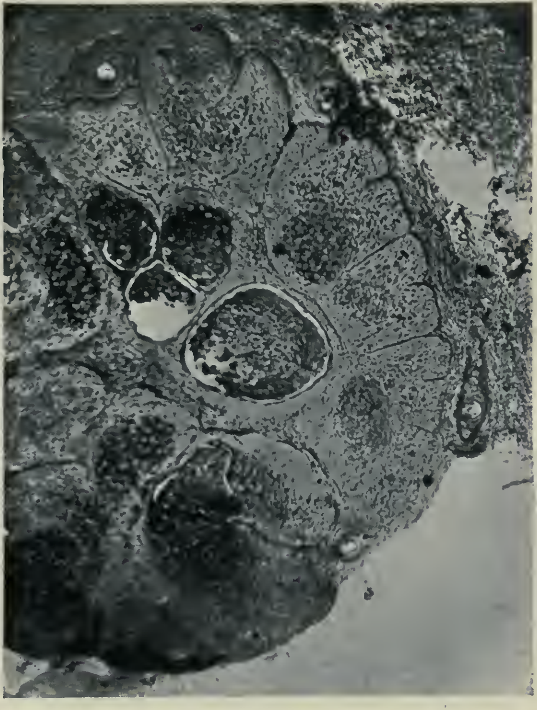


Fig. 1.

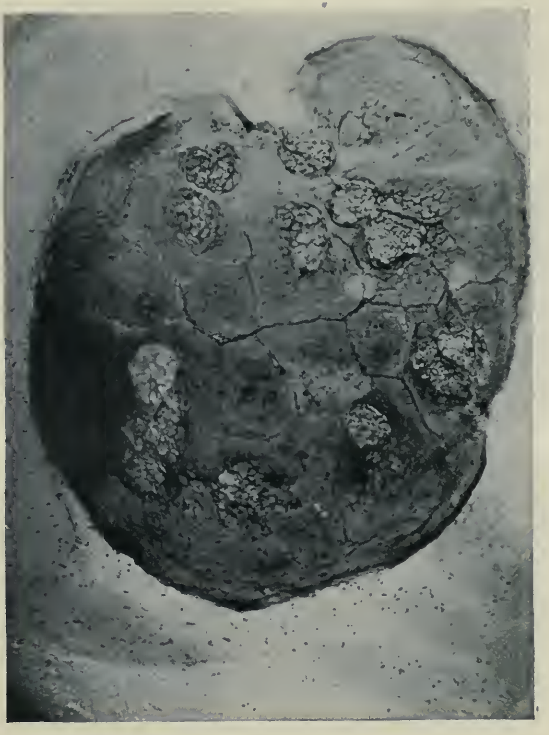


Fig. 2.

ILLUSTRATING DRS. HAROLD GIFFORD AND SANFORD R. GIFFORD'S ARTICLE ON "MOLLUSCUM CONJUNCTIVITIS."

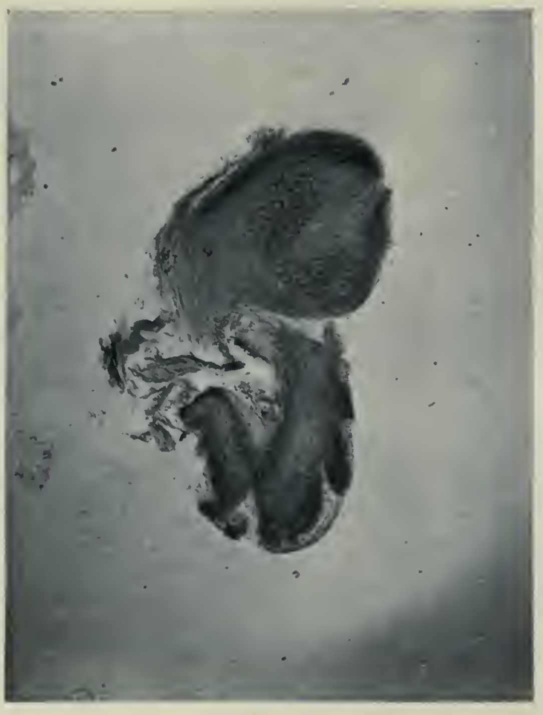


FIG. 3.

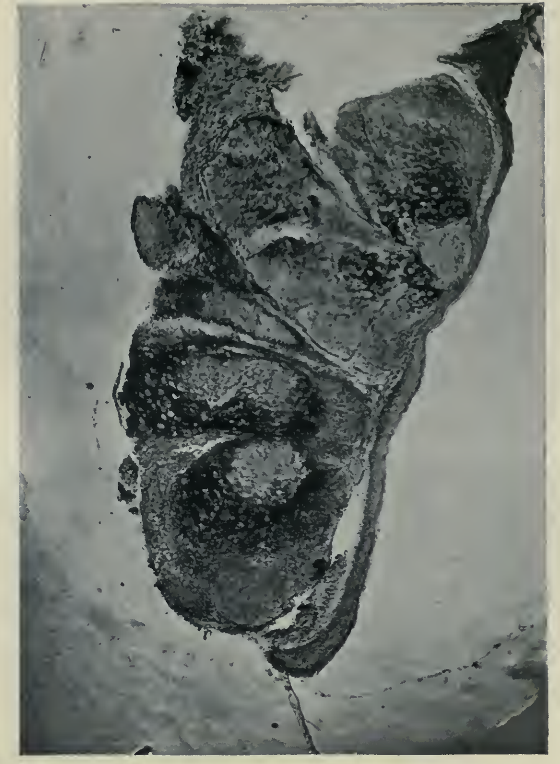


FIG. 4.

ILLUSTRATING DR. ALLEN GREENWOOD'S ARTICLE, "LACRIMAL SAC EXTIRPATION SIMPLIFIED."

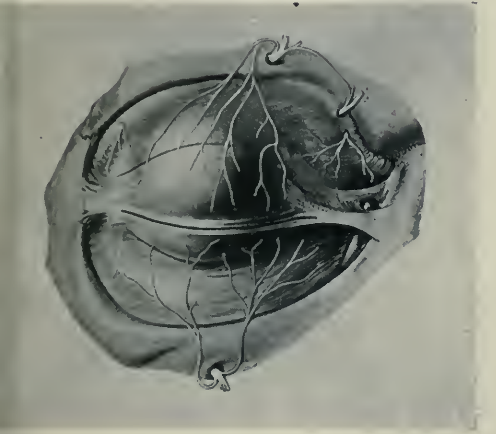


FIG. I.

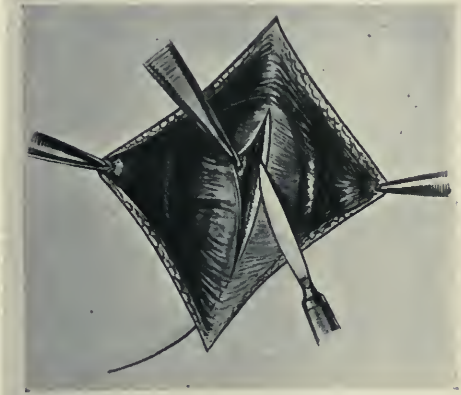


FIG. II.

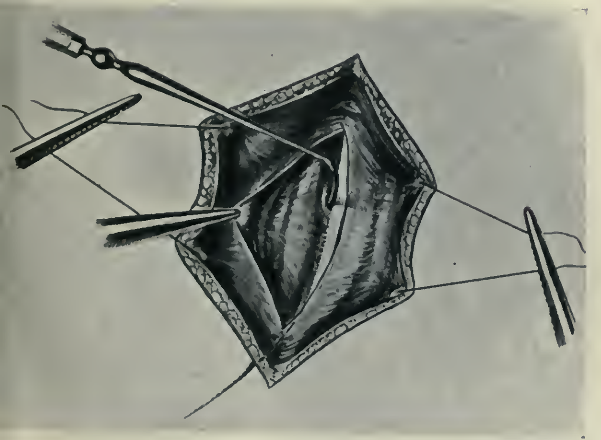


FIG. III.

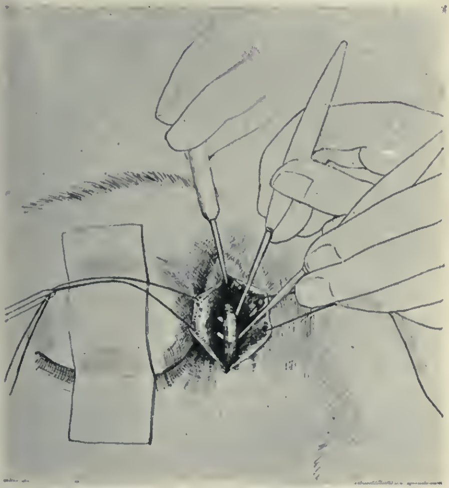


FIG. IV.

ILLUSTRATING DR. I. BARRAQUER'S ARTICLE "PHACŒRISIS."

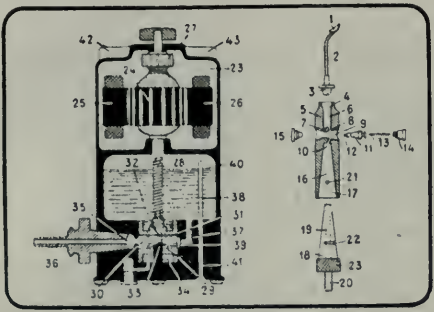


FIG. 1.

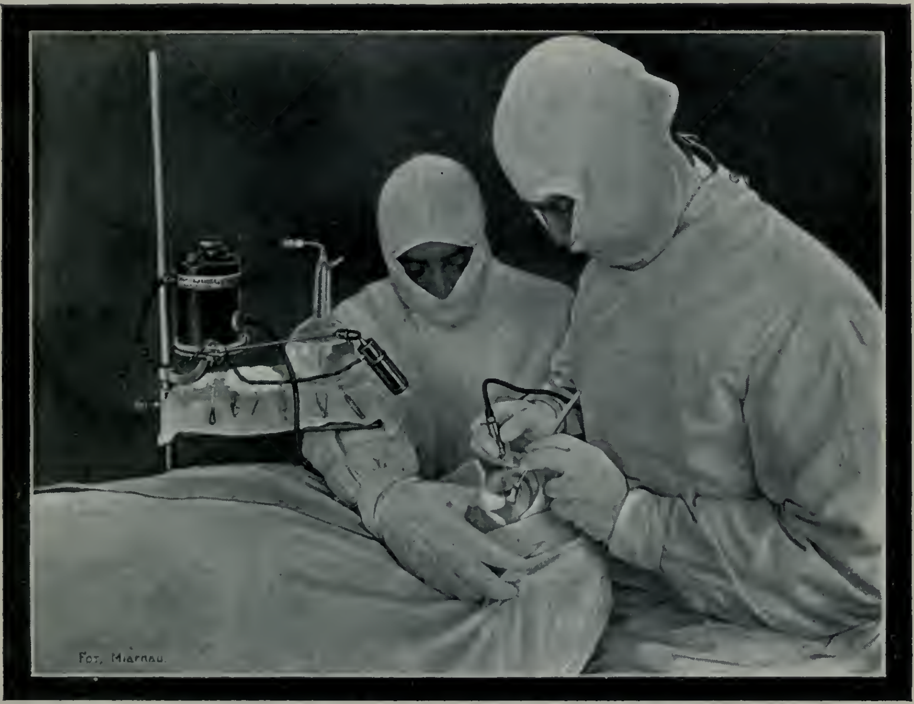

Fot. Miarnau.

FIG. 2.

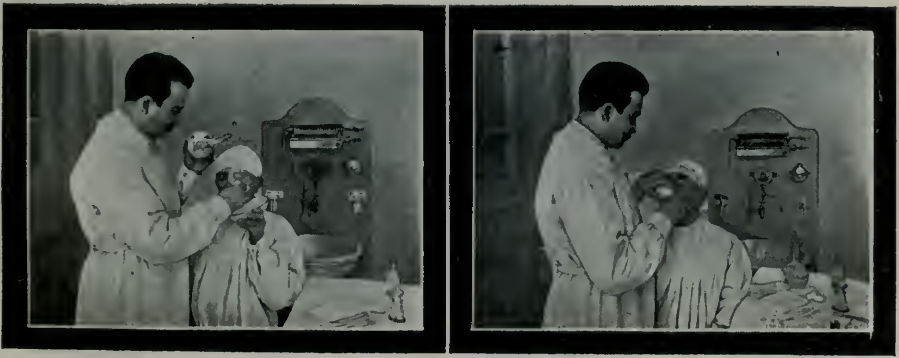


FIG. 3.

ILLUSTRATING DR. I. BARRAQUER'S ARTICLE "PHACŒRISIS."

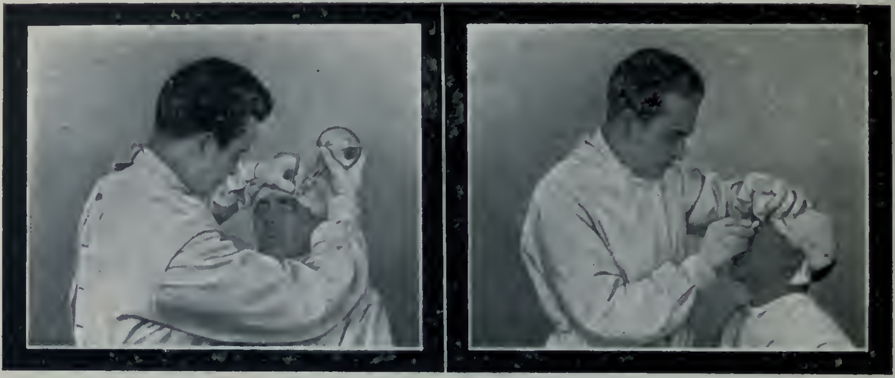


FIG. 4.

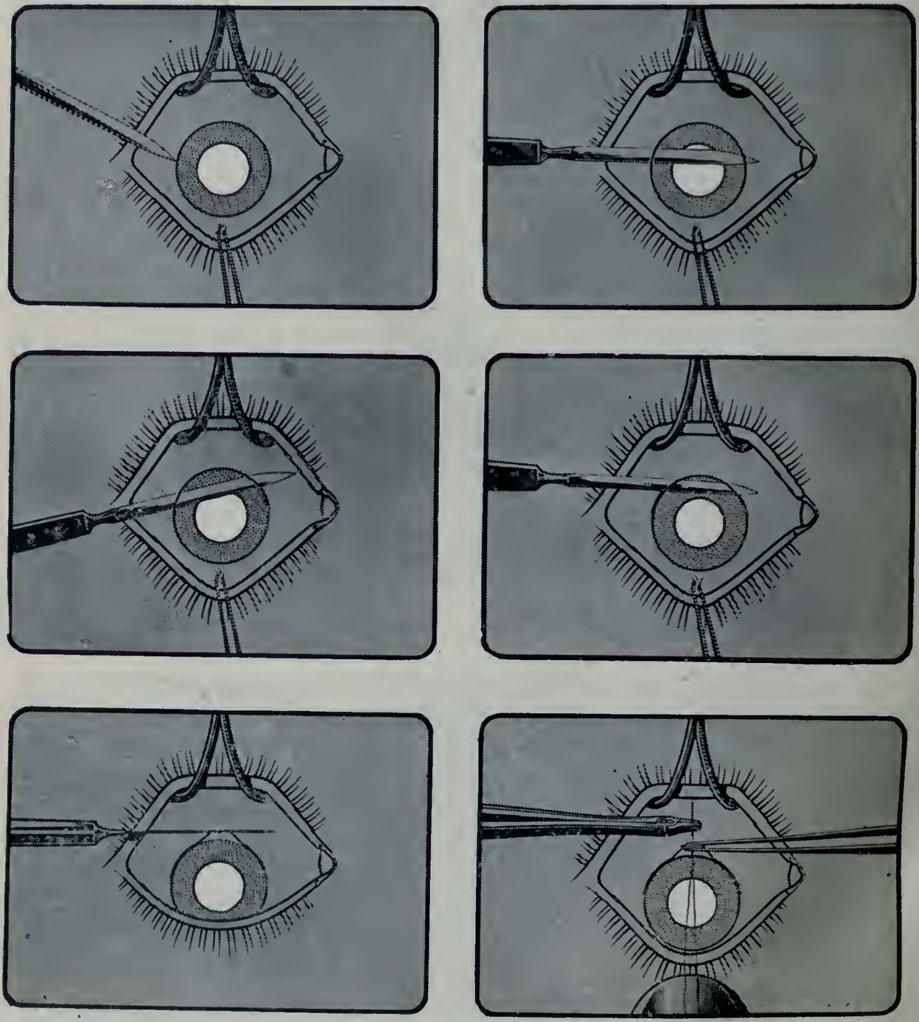


FIG. 6.

ILLUSTRATING DR. I. BARRAQUER'S ARTICLE "PHACŒRISIS."

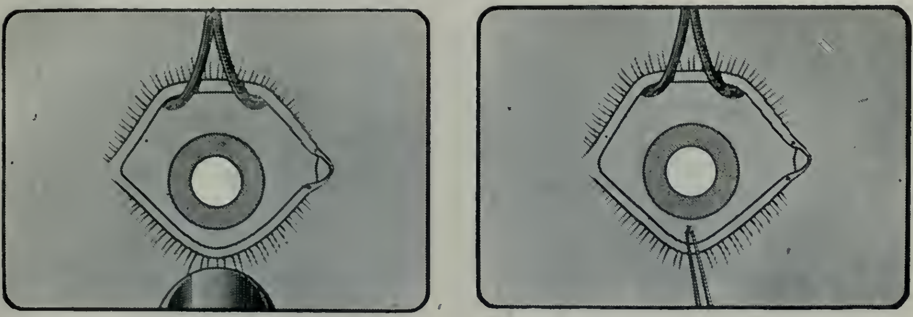


FIG. 5.

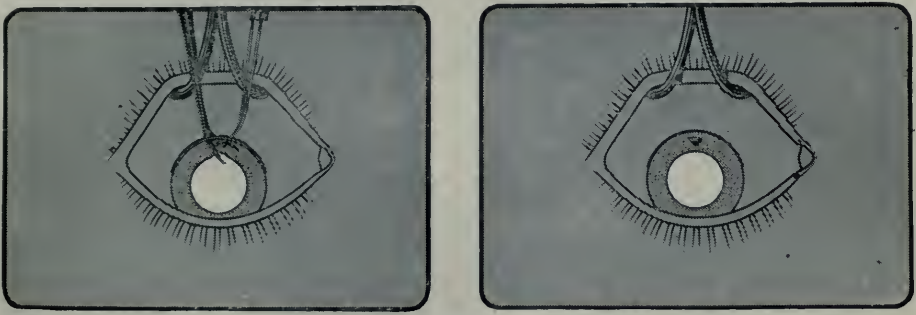


FIG. 7.

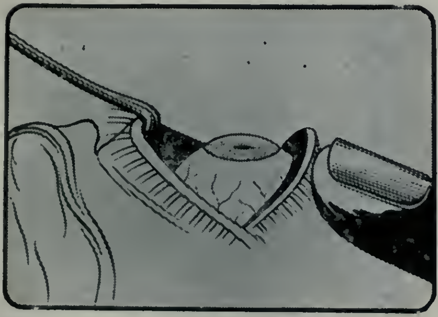


FIG. 8.

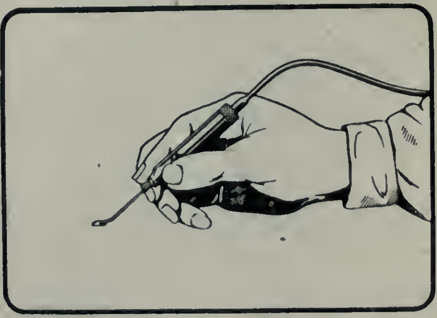


FIG. 9.

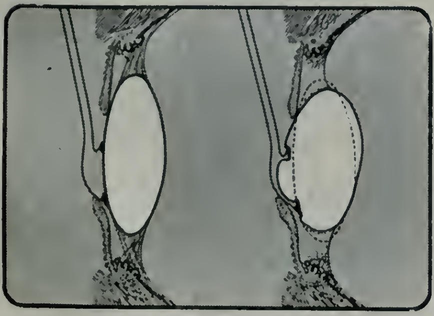


FIG. 10.

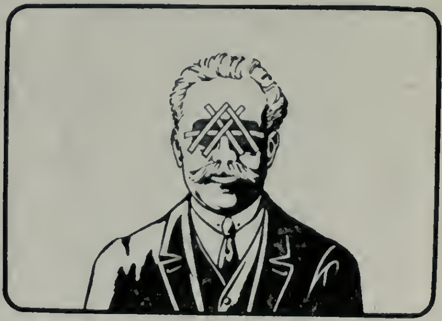


FIG. 13.

ILLUSTRATING DR. I. BARRAQUER'S ARTICLE "PHACŒRISIS."

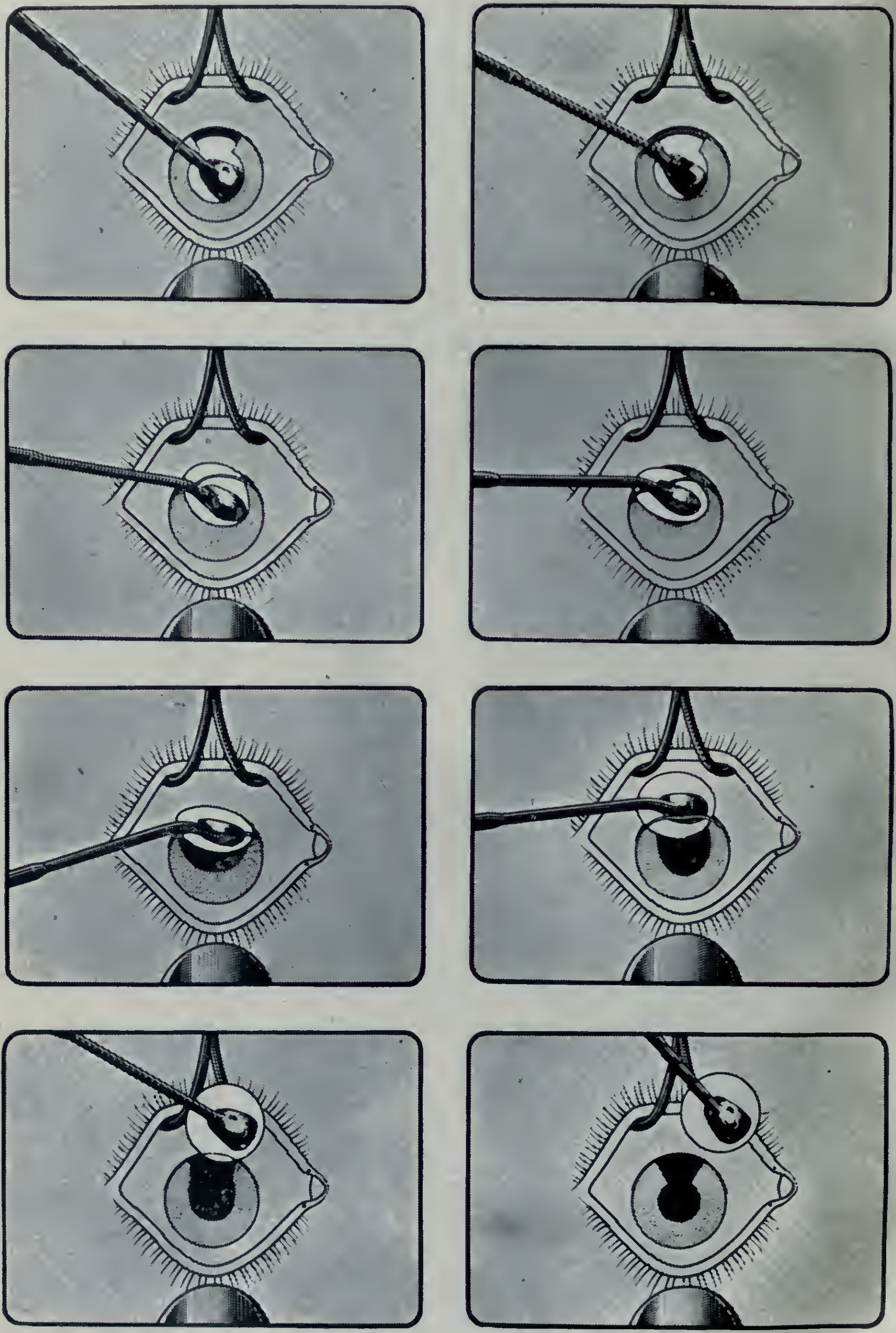


FIG. 11.

ILLUSTRATING DR. I. BARRAQUER'S ARTICLE "PHACŒRISIS."

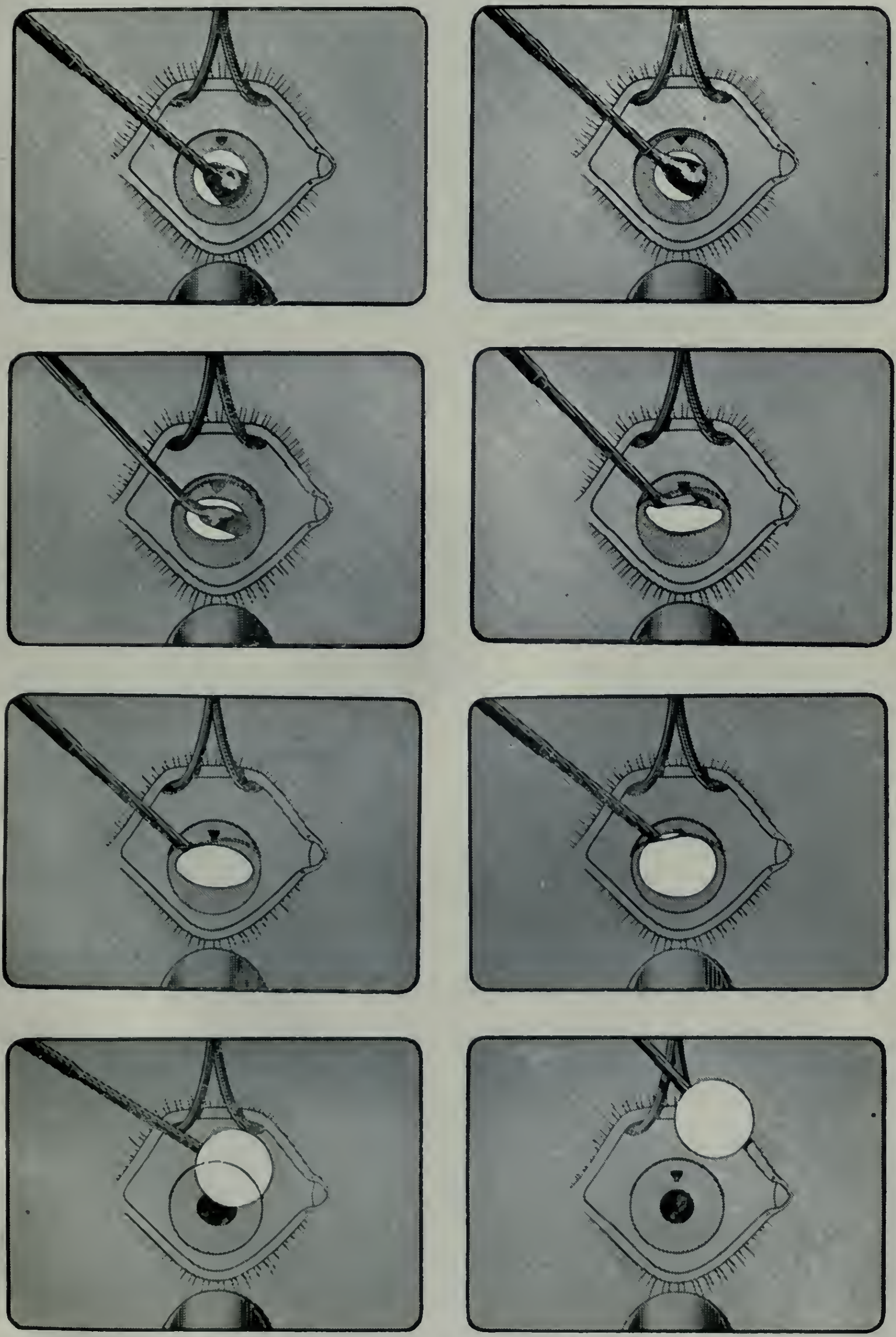


FIG. 12.

Arch. of Ophthal., Vol. L., No. 4. Text-Plate XXI.

ILLUSTRATING DR. MARTIN COHEN'S ARTICLE "A MERCURY TONOMETER."

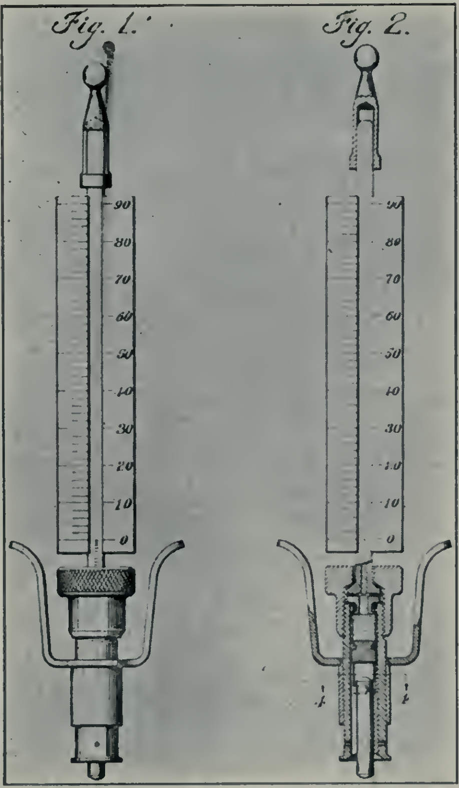


FIG. 1.

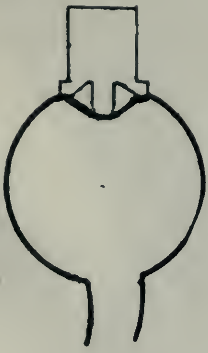


Fig. 2.

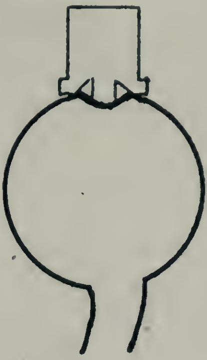


Fig. 3

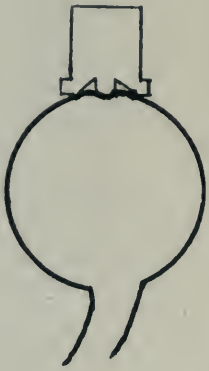


Fig. 4

ILLUSTRATING DR. MARTIN COHEN'S ARTICLE "A MERCURY TONOMETER."

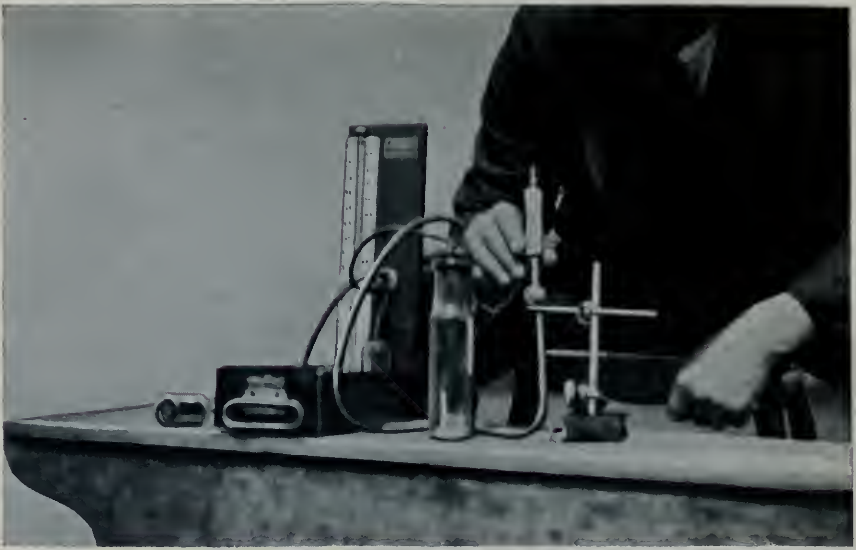


FIG. 5.

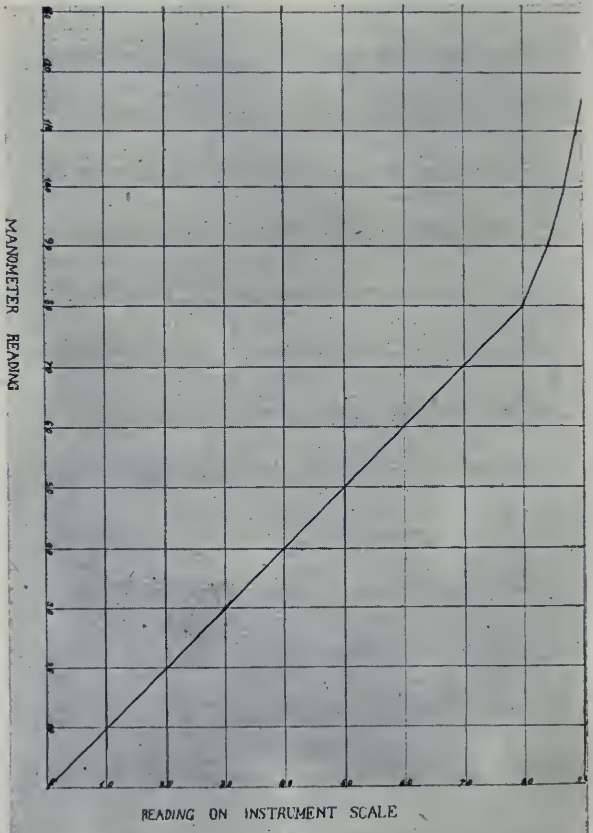
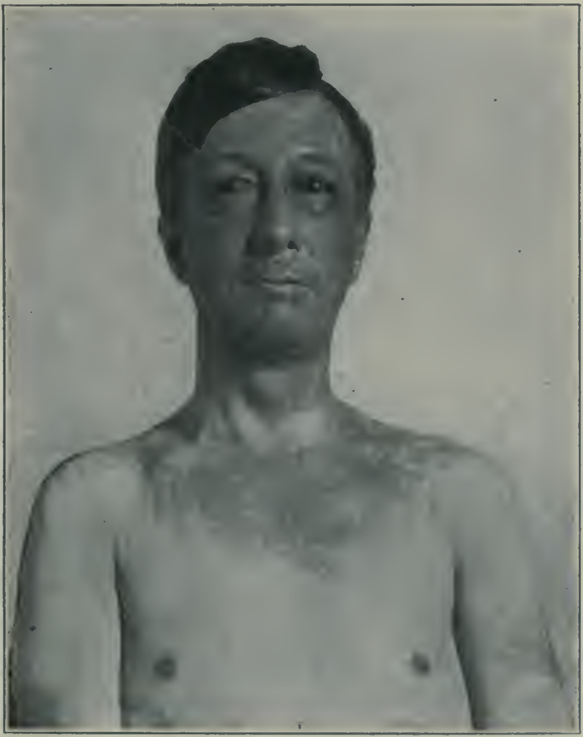


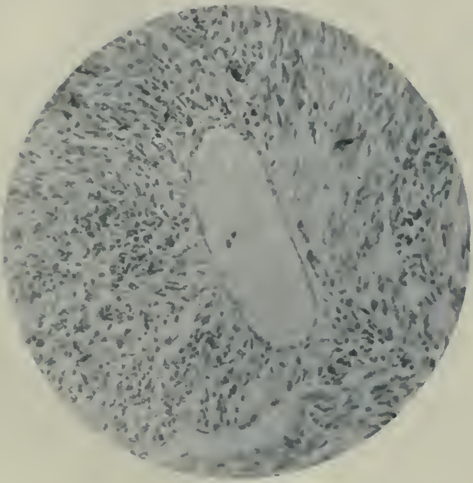
FIG. 6

ILLUSTRATING DR. PAUL D. BERRISFORD'S ARTICLE "THE OPHTHALMOLOGICAL FINDINGS IN TRAUMATIC ASPHYXIA."



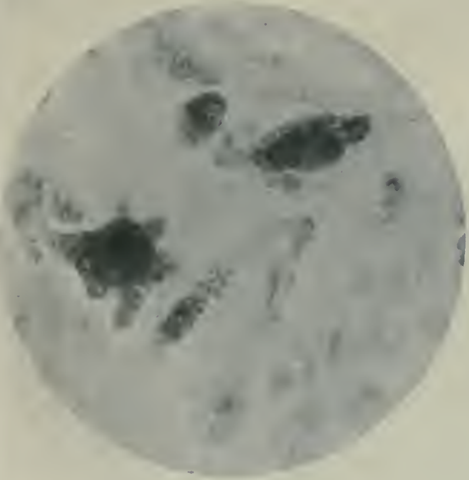
Photograph of the Patient Four Days Following the Injury.

ILLUSTRATING DR. ADOLPH O. PFINGST'S ARTICLE ON "MELANOSARCOMA OF THE CHOROID OCCURRING IN BROTHERS."



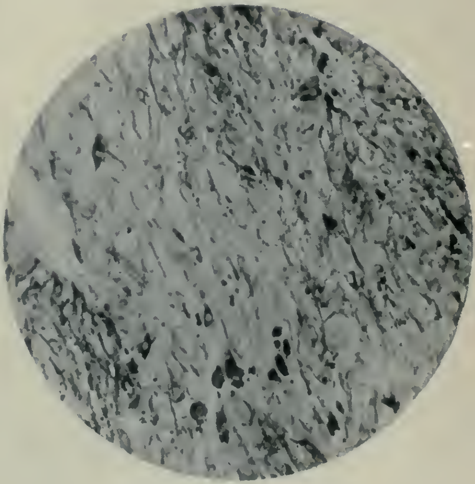
SECTION OF TUMOR NO. 1.

Mag. 230 Diam. showing large amount of cellular element with a large thin-walled blood-vessel.



SECTION OF TUMOR NO. 1.

Mag. 1000 Diam. showing spindle-shaped cells with large amount of pigment in cytoplasm.



SECTION OF TUMOR NO. 2.

Showing predominance of cellular element and abundance of pigment.

ILLUSTRATING DR. H. D. LAMB'S ARTICLE ON "A CASE OF KELOID OF THE CORNEA."

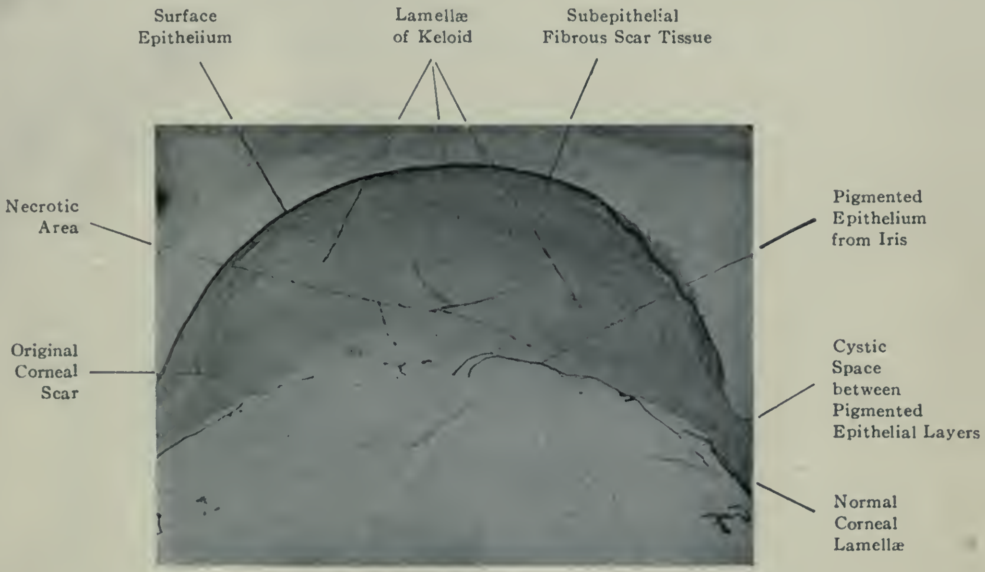

Surface Epithelium
Lamellæ of Keloid
Subepithelial Fibrous Scar Tissue
Necrotic Area
Original Corneal Scar
Pigmented Epithelium from Iris
Cystic Space between Pigmented Epithelial Layers
Normal Corneal Lamellæ

FIG. 1.—Keloid of the Cornea under Low Power.

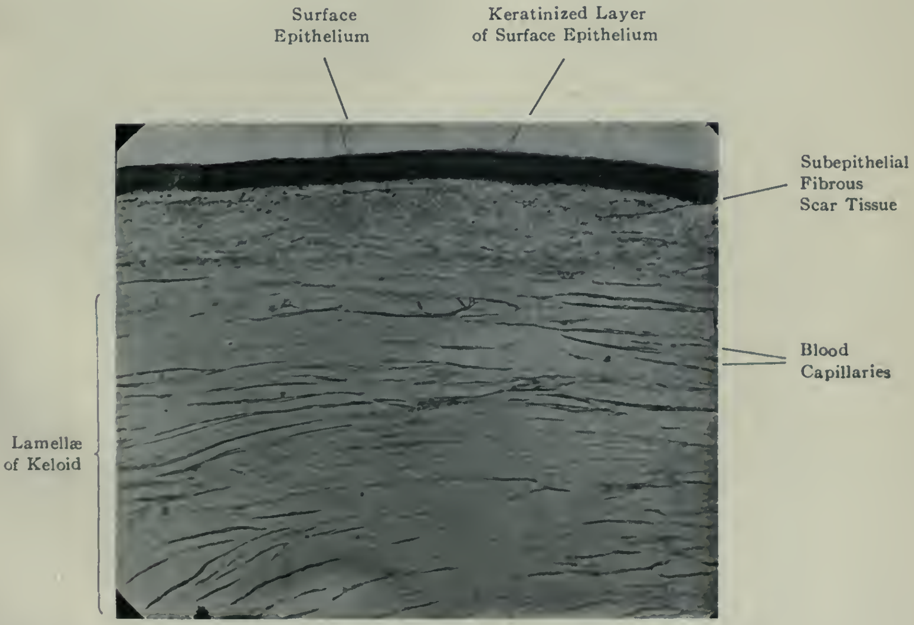
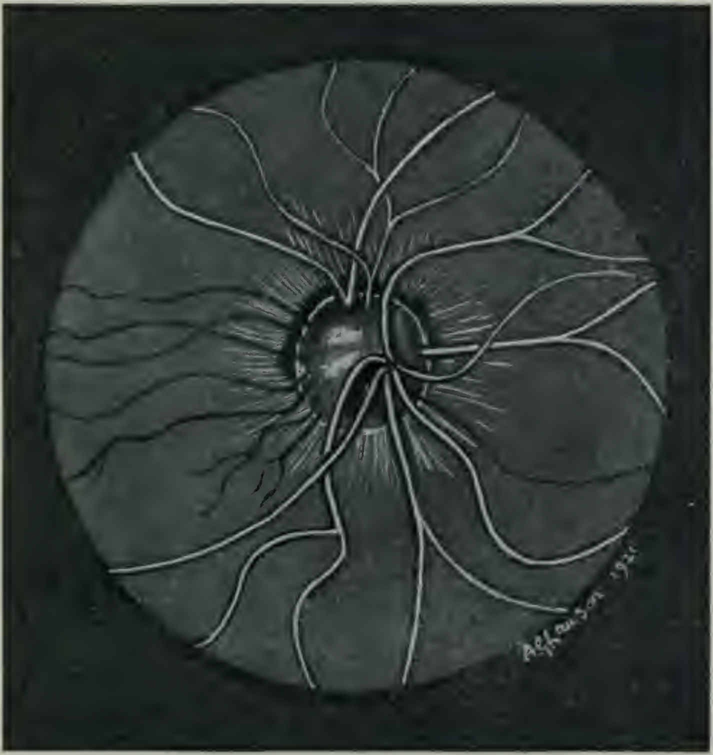

Surface Epithelium
Keratinized Layer of Surface Epithelium
Subepithelial Fibrous Scar Tissue
Blood Capillaries
Lamellæ of Keloid

FIG. 2.—Portion of Keloid of the Cornea under High Power.

ILLUSTRATING DR. W. GORDON M. BYERS'S ARTICLE ON
"A CASE OF INTERMITTENT EXOPHTHALMOS."



A drawing showing the distribution of the retinal vessels over, and in the vicinity of, the right optic disk.

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